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THE PATELLID LIMPETS OF THE WORLD (PATELLIDAE)

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Introduction

This monograph deals with the Patellidae, one of the five families of limpets that comprise the superfamily Patellacea. The patellid limpets are of littoral and shallow-water occurrence and although widely distributed, cannot be considered cosmopolitan, since they are absent from certain extensive areas, namely, both coasts of North America, the Caribbean, and South America, north of Chile and Patagonia.

Although this work is concerned primarily with the Indo-Pacific fauna, it is deemed necessary to extend the scope to world coverage in order to explain the otherwise apparently anomalous distributional patterns.

A complication is encountered with the deceptively similar shells of an allied family, the Acmaeidae, members of which are easily separable from the Patellidae upon anatomical grounds, but the shell of which usually has no character that can be considered consistently diagnostic; hence, with fossil limpets there is often an element of doubt regarding family allocation.

Where patellids are absent, notably along the North West American coast, the acmaeids take over the corresponding littoral, ecological niche, and in so doing, attain shell sizes very large for acmaeids, which usually are of relatively smaller size than patellids. A striking instance of gigantism is the Californian *Lottia gigantea* Gray, 1834, which may reach a length of four inches.

Limpets tend to vary greatly in size, shape, sculpture and colour pattern, due to the ecological factors involved, particularly the relative exposure to wave stress and the nature of the substratum. Often, specific limits are apparent only when extensive series from a number of stations are studied.

Limpets featured frequently in early conchological works, but many of the species named are difficult to determine with accuracy, since, for the most part, they were based upon crude figures, inadequate descriptions, and with uncertain locality data.

Under the heading of "Species no longer included in the Patellidae" (pp. 84 to 87) 259

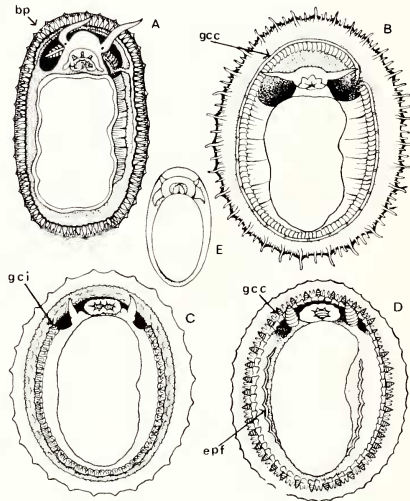


Plate 60. Gill structures in the Acmaeidae, Patellidae and Lepetidae.

A = *Acmaea virginea* (Müller); bp = branchial plume, behind head.

B = *Patella vulgata* Linnaeus; gcc = gill cordon, complete.

C = *Cellana radians* (Gmelin); gci = gill cordon, interrupted over head area.

D = *Nacella (Patinigera) terroris* (Filhol); gcc = gill cordon complete; epf = epipodial fringe (only in *Nacella* and *Patinigera*).

E = *Lepeta coppingeri* (E. A. Smith); no gills; respiration by means of cilia-lined pallial groove.

(Fig. A from Fretter and Graham, 1962, p. 120, fig. 73. Fig. E from Eales, 1923, p. 6, fig. 3).

species, described as *Patella* are listed, and their present familial location indicated. This list includes species now known to belong to the Acmaeidae, Lepetidae, Phenacolepatidae, Cocculinidae, Fissurellidae, Stomatellidae, Calyptraeidae, Capulidae, Hipponicidae, Muricidae, Trimusculidae, Siphonariidae, Umbraculidae, Ancyliidae, and even one considered to be based upon one of the accessory plates of a member of the Pholadidae.

Family Patellidae Rafinesque, 1815

The family Patellidae is one of three widespread families—the Acmaeidae Carpenter, 1857, the Patellidae Rafinesque, 1815, and the Lepetidae Dall, 1869, all belonging to the superfamily Patellacea.

Two other families, consisting of fossil species only, are placed provisionally in the Patellacea; they are the Metoptomatidae Wenz, 1938, of the middle Silurian to middle Permian, and the Symmetrocapulidae Wenz, 1938, of the Triassic, Jurassic and possibly Cretaceous.

The limpet shell is a simple shield or cap-shaped structure, and is unfortunately a shell-form that is simulated by molluscs belonging to several other gastropod orders. The one most frequently mistaken for a patellid limpet is *Siphonaria*, a member of the air-breathing pulmonates, being almost at the top rung of the gastropod ladder of evolution, whereas the Patellacea are located down towards the foot of the ladder. In between are the fissurellids, crepidulids, capulids and umbraculids, all of which have certain members that have limpetlike shells.

Limpetlike shells have developed independently in direct response to ecological necessity, being the shell-form affording the greatest amount of suction area for clinging to a rock surface, coupled with a low profile to withstand wave stress.

Classification of the patellid limpets, therefore, is dependent upon some knowledge of the animal. Even the allocation of species to either the Acmaeidae or the Patellidae, the two major families of the Patellacea, in many instances becomes conjectural upon the evidence from the shell alone.

Anatomical Outline of the Families and Major Genera of the Patellacea

Family Acmaeidae

- A Leaf-shaped ctenidium only *Acmaea*
 B Ctenidium present, plus gill cordon.
 Radula; closely spaced pair of centrals alternating with wider spaced pair of laterals; marginals vestigial or absent.
 Gill cordon complete *Scurria*
 Gill cordon interrupted by head *Lottia*

Family Patellidae

- C Ctenidium absent; replaced by gill cordon.
 Radula; 4 or 5 central teeth, median one present, vestigial or absent; lateral large, pluricuspid; marginals 3, weak or vestigial.
 Gill cordon complete *Patella*
 Radula; median central vestigial or absent; alternate pairs of long curved centrals and laterals; marginals 3, weak to vestigial.
 Gill cordon interrupted by head.
 Epipodial fringe absent *Cellana*
 Gill cordon complete.
 Epipodial fringe present *Nacella*; *Patinigera*

Family Lepetidae

- D No gills; respiration by cilia-lined pallial groove.
 Radula; large central, with prominent dentate cusp; no laterals;
 2 functional marginals *Lepeta*

Biology

The embryo of *Patella* hatches 24 hours after fertilization. The trochophore is about 0.18 mm. in diameter, with a tuft of erect apical cilia and two rows of ciliated cells around the greatest perimeter of the larva. The cilia beat in the clockwise manner and rotate the top-shaped larva through the water. Two days after fertilization the larva is transformed into a pretorsional veliger, and both shell and foot appear. Torsion then begins while the larva is free-swimming. During the next stage of about 30 hours the larva both swims and crawls, and torsion is completed when the larva is $3\frac{1}{2}$ to 4 days old, and this marks the end of its pelagic life. The velum does not disappear until the snail has been actively crawling for about the third week. About this time the operculum is lost. The shell of the veliger is a dextral coil of scarcely one whorl, and this is soon replaced by a new shell, after which the limpet's post-larval life continues into the adult. (see Fretter and Graham, 1962, pp. 448-450 for a more detailed account).

The English *Patella vulgata* is a protandrous hermaphrodite with most, if not all, individuals starting life as male but later changing to female at the age of one year or more. Investigations of English populations of *vulgata* have shown that 90% of the limpets between 16 and 25 mm. in length are male; in those about 40 mm. in length the sexes are about equal; and in those 60 mm. or more in length most are female (see Fretter and Graham, 1962, p. 372).

Most patellids feed upon small species of living algae, but some live upon giant kelp, where they scrape away the surface tissue. The rock-dwelling patellids feed with the head end moving methodically from side to side, while the radula operates like a scythe. Patellids often travel up to four or five feet in search of food, and usually manage to return to their original resting places. This sometimes involves re-finding a site previously excavated in the rock that exactly fits the indentations of the shell margin. When rock faces have a slight coating of silt, limpet journeys can be seen quite plainly, and possibly the limpet uses its outward track in finding its way home.

The age attained by limpets varies greatly according to the species involved, the food potential of the particular habitat, and the zone in which the species occurs. Fretter and Graham (1962, p. 501), quoting Russell (1909), recorded that *Patella vulgata* from certain established populations in Scotland attained a length of about 29 mm. in the first year, during which time they

reached sexual maturity. The estimated sizes reached for each of the four succeeding years were respectively 38, 44, 48 and 53 mm. On the other hand, the same species under more favourable conditions at Plymouth reached a length of 53 mm. by the end of the second year. The estimated life span for *vulgata* is about 15 years.

Very large and massive species, such as *mexicana* and *kernadecensis*, probably live for a much longer time, but size is governed also by the availability of a suitable rock substrate, not unduly encroached upon by barnacles, corals, or other encrusting marine growths. In the tropical Indo-Pacific it is unusual to find large-sized limpets associated with coral reefs, unless there are intrusions of basaltic lava. In general large-sized limpets are more frequent in cool-temperate waters than they are in the tropics.

Limpets that live in the upper tidal zone are usually taller than individuals inhabiting the lower tidal zone. Fretter and Graham (1962, p. 501), quoting Orton (1932), correlated these differences with the degree of exposure to desiccation. Limpets living near low water mark remain exposed for only a short period by the tide, but high-water limpets are uncovered for the greater part of the day, and this results in a general drying out of the habitat.

To prevent desiccation the limpet must hold firmly to the rock for the whole period that it is out of water, and it is suggested that this constant application of force by the attachment muscles tends to pull in the mantle skirt, which is responsible for new growth around the shell margin. This produces a taller and narrower shell than that produced by an animal living lower down in the tidal zone.

Limpets from very exposed situations often appear to be very different from examples living in more sheltered situations. In the exposed examples, the shell becomes very flat in order to withstand wave stress. As a result of this lowered profile, the apex is located nearer to the anterior end.

The colour patterns exhibited by juvenile limpets tend to be less variable than those in more mature examples of the same species, and often provide more satisfactory diagnostic criteria. This is especially evident in *Cellana strigilis* populations from the southern islands of New Zealand (Powell, 1955, pp. 65-67).

Surface erosion of the shell also greatly alters the colour pattern. Thomson (1919, pp. 264-267) described how erosion in *Cellana radians* often eliminates the transverse "earlii" pattern, but

the pigmentation of the radial ribs survives due to deeper impregnation of the shell substance. With the shrinkage of the animal in senile examples, a thick, unicoloured callus is built up on the inside of the shell, blotting out any maculations that may have survived external erosion.

The Patellidae are the most successful and the most advanced family of the Patellacea. The change from a simple leaf-shaped ctenidium in the Acmaeidae, to a gill cordon in the Patellidae results in more efficient aeration. Although *Scurria* and *Lottia* have developed a gill cordon they still retain the acmaeid ctenidium. In the Patellidae the ctenidium has entirely disappeared, leaving the gill cordon as the sole means of respiration.

Patellid limpets have become so successful in their chosen littoral environment that in some locations, South Africa in particular, certain species have become the dominant organisms of several animal communities. In the "Cochlea zone" of South Africa the species *Patella cochlea* is so abundant that almost all other forms of animal life are crowded out. A density of 1,300 individuals of this limpet to the square yard has been recorded, in so dense a concentration that as many as 40 small individuals were found crowded on top of a single large shell.

The radula

The radula in the Patellidae is long and narrow, especially in *Cellana*, in which it sometimes has a length of as much as four times that of the shell. In situ it is concentrated in loose coils on the left hand side when viewed from above. On the other hand, *Patella* has a much shorter radula that folds back upon itself at the nascent end.

The *Patella* radula consists of a strong or weak or rarely absent median central, flanked by a pair of centrals on either side, followed by a large pluricuspid lateral, and finally, three weak, slender, functionless marginals. The latter may be fused into a single plate. Well-developed cusps, capped with a dark stain containing magnetite, are present on the multiple centrals and the pluricuspid laterals, but cusps on the remaining teeth are small to vestigial, and colourless.

In *Cellana* and *Nacella* the radula differs from that of *Patella*, in that the functional teeth are a pair of long, large, centrals, closely-spaced, on either side of a vestigial plate, which also may be absent, alternating with a wider-spaced pair of similar, well-developed laterals; the functionless marginals are as in *Patella*.

In *Patella* the multiple centrals and the large pluricuspid lateral have relatively short recurved cusps, but in *Cellana* and *Nacella*, the alternating pairs of centrals and laterals are very long and project arcuately upward, almost at right angles to the base. These long, strongly upcurved teeth present difficulty in slide preparation, for they are easily pressed at varying angles in mounting, and thus may assume very different shapes. A satisfactory solution to this problem is in the use of cavity slides, that bridge the radula across, so that the teeth assume their normal upright position over the cavity, but are pressed sideways, beyond the limits of the cavity, thus giving details of denticles or indentations along the sides of the teeth.

Many writers have endeavoured to use the length of the radula in relation to the length of the shell for separating three assumed closely allied English *Patella*. The range of the means arrived at by Fretter and Graham (1962, p. 495) is tabulated below.



Plate 61. Fig. 1. *Patella vulgata* Linnaeus; England. Radula. Fig. 2. *Patella caerulea* Linnaeus; Trieste. Radula. From Thiele, in Troschel and Thiele, 1891, pl. 28, fig. 18.

vulgata intermedia aspera

Length of radula	1.51-1.75	1.60-2.10	1.05-1.15
Length of shell			

Unfortunately, in that work, there is no precise indication of the actual identity of the species termed *Patella intermedia*, there being four different usages of that combination by four different authors.

Brian and Owen (1952, pp. 241-249) provided a useful table, giving the valid name equivalents for the nomenclature used in papers on European Patellidae, published up until 1948 (see under heading of *Patella intermedia* Auct.). Following is the summary of Brian and Owen's conclusions.

"*Patella vulgata* L. were collected from high- and low-water levels on five different beaches and the lengths of the shells and radula measured. In all five localities the mean shell length was less and the mean radula length greater at the higher level, but the difference was not consistently significant."

"The complexity arose from the mergence of two conflicting tendencies: one, intralevel, a positive regression of shell-length and radula. While the former is no doubt a growth phenomenon, the latter is probably an environmental effect—at higher level exposure to desiccation and consequently, prolonged adherence to the substrate, caused a smaller shell base; reduced feeding time caused a longer radula. These factors may have resulted in confusion when comparing the values of the radula fractions of species of *Patella*."

Lowenstam (1962) has shown that the radular teeth in the limpets, *Acmaea*, *Lottia* and *Patella*, are capped with goethite, a dark opaque mineral of high iron content. This gives the dark-stained primary cusps of the patellacea a hardness of almost 5 on the Moho hardness scale, whereas the radular hardness in the Littorinidae, the Fissurellidae and certain trochoids is only between 2 and 3.

This hardness factor in the radula enables limpets to erode limestone and other rocks of comparable hardness, as well as the external surface of other shells. Limpets frequently excavate deep depressions in the rock to form a base of attachment, and are known to return to their own particular site after a nightly foraging excursion.

Lowenstam (1962a) also suggested that since, in the case of chitons, the dark stained denticle caps show the presence of magnetite, then it is possible that these magnetised teeth may serve as a guidance system for the so-called homing instinct of both chitons and limpets.

Geographical Distribution of the Patellacea

The family Patellidae has achieved a very wide distribution, extending from near the Arctic Circle to the Antarctic Circle, the western Atlantic, Mediterranean, West and South Africa, the Indo-Pacific to as far north as northern Japan, eastward to the Hawaiian Chain and the Island of Juan Fernandez, and southward to Australia, New Zealand, the subantarctic of the southern end of South America, the islands of the Southern Ocean, and even a few locations adjacent to the Antarctic Continent.

Strangely, there are no patellids on either the east or the west coasts of North America, the Caribbean and most of South America. The only exceptions are the giant *Patella (Ancistromesius) mexicana* from tropical Central America, obviously derived from the Indo-Pacific when the former Tethys Sea was an open waterway around the perimeter of the globe, and the cold water *Nacella-Patinigera* complex that is strongly represented in southern Patagonia and Chile, and from there spread eastward to the islands of the Southern Ocean.

The Recent distributional patterns for each of the three families of the Patellacea are outlined below (see plate 62).

Acmaeidae: The typical genus, *Acmaea*, is of worldwide distribution, but has its greatest development in western North America, where it takes the place of the Patellidae, members of which are absent from that area. Two other genera of the Acmaeidae, *Scurria* and *Lottia*, are apparent forerunners of the Patellidae, since they have developed pallial gills, additional to the single gill-plume of typical *Acmaea*. Their present range is along the west coast of both North and South America.

Patellidae: Typical *Patella* is well-represented along the western coast of Europe, from the Lofoten Islands to Great Britain, down to Spain, the Mediterranean, the West African mainland and off-shore islands, then southward to South Africa, where typical *Patella* becomes more or less merged into a composite local fauna of cold and warm-water subgenera. From there the genus continues, in subgeneric form, across to the warmer water island groups of the Indo-Pacific, extending northward to Japan, eastward to the west coast of tropical Central America, and southward to the Kermadec Islands and the temperate waters of southern Australia and Tasmania.

The genus *Cellana* is confined for the most part to the warm and cool temperate waters of the

Indo-Pacific, but in the New Zealand area it actually extends southward into subantarctic waters. The farthest westward reached by *Cellana* is the coast of Natal, the farthest eastward the island of Juan Fernandez, off the coast of Chile, and the farthest northward, Japan.

A third major genus in this family is *Nacella*, containing the important subgenus *Patinigera*. These are truly cold-water limpets, the greater part of their range being subantarctic, but extending to the Antarctic by way of the Scotia Arc, and also ranging northward up the Chilean coast to at least Valparaiso, assisted in this by the upwelling of cold water along that coast. The present concentration of the genus is in the Magellanic area, and from there it spreads eastward, assisted in this by the prevailing West Wind Drift. Many of the species live upon the large kelps which provide an effective means of chance dispersal when quantities of the weed are wrenched free and drift before wind and current. The farthest eastward that this genus has established itself is Kerguelen Island, and for the subgenus Campbell Island in the New Zealand southern islands.

The genus *Nacella* and its subgenus *Patinigera* have a distinctive epipodial fringe, not found so far in any other genus of the Patellacea. The European Tertiary fossils attributed to *Nacella* probably belong to other genera.

Lepetidae: This family consists of rather small featureless white limpets, mainly from the deeper waters of the Arctic Ocean, the north Atlantic, the north Pacific, Mediterranean, Patagonia and Antarctica. They are rather specialised, but not necessarily highly advanced. There are no gills, and respiration takes place through a cilia-lined pallial groove. The presence of a large, broad-based central tooth, with a conspicuous, broadly-triangular, dentate cusp, no laterals, but a pair of functional marginals, are radular characters not found in the other two living families of the Patellacea.

Fossil Occurrences of the Patellidae

Although a considerable number of fossil so-called *Patella* species are encountered in literature, especially those from European Tertiary localities, few of them can be assigned with certainty to that genus. The problem faced by workers with Recent species of the Patellacea, that of distinguishing between the Acmaeidae and the Patellidae when the animal is unknown, is even more a matter of conjecture when fossil species are under consideration, especially with those from the older formations, that have shell features unlike those of living species.

The earliest species of the Patellidae that can be generically identified with some degree of con-

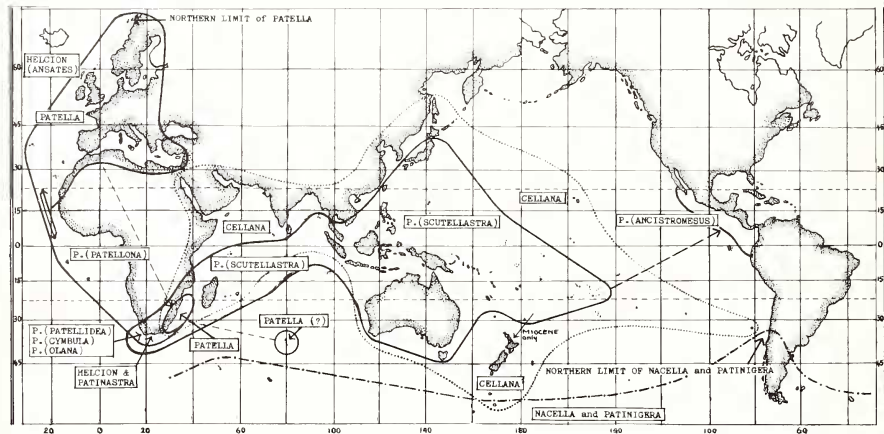
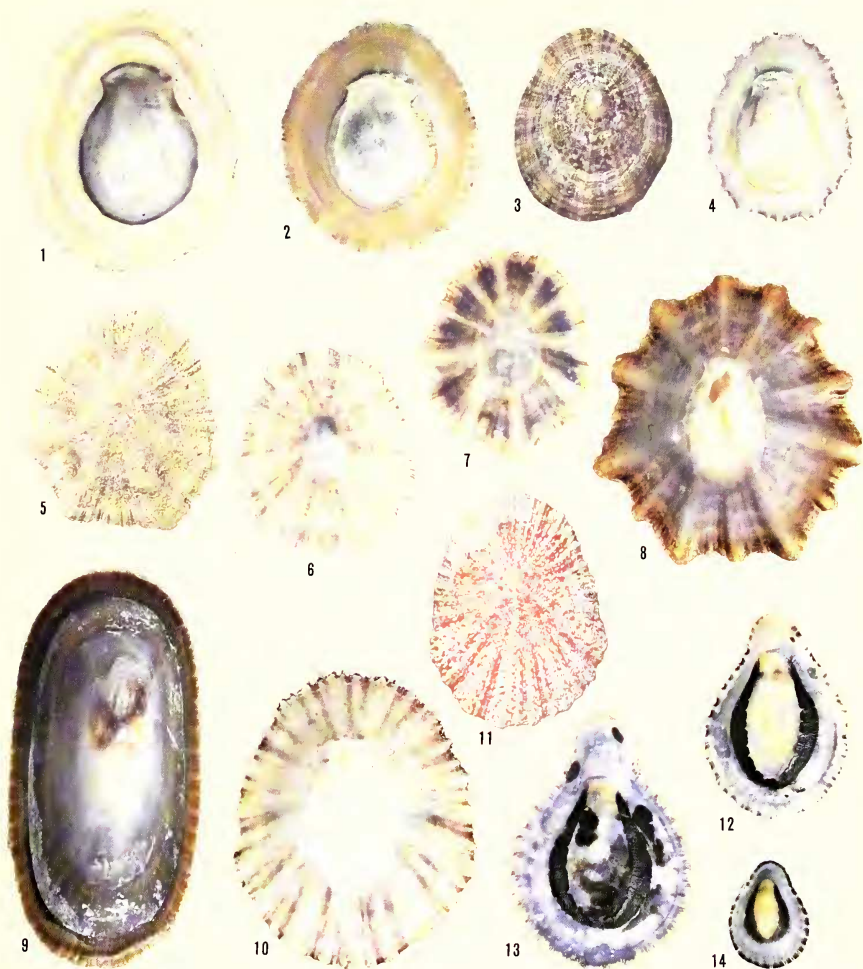


Plate 62. Geographical distribution of the Patellidae. Note the almost entire absence of the family from North America, and most of South America, with the exception of one species, *Ancistromesus mexicana*, which occurs along the west coast

of Central America, and *Nacella*, with its subgenus *Patinigera*, in the southern part of South America, from where it has drifted eastward over much of the Subantarctic and in some areas of the Antarctic.

Plate 63. European and South Africa *Patella*

Figs. 1-3 *Patella vulgata* Linnaeus, 1758. Figs. 1, 2. Caddy Island, South Wales. Fig. 3. Ilfracombe, England.
 Fig. 4 *Patella aspera* Röding, 1798. Caddy Island, South Wales.
 Figs. 5-7. *Patella caerulea* Linnaeus, 1758. Isle of Capri, Italy.
 Fig. 8. *Patella caerulea* Linnaeus, 1758 (forma *crenata* Gmelin, 1791). Madeira.

Fig. 9. *Patella (Cymbula) compressa* Linnaeus, 1758. Kommetje, Cape Peninsula, South Africa. Lives on large kelp; always sideways compressed.
 Figs. 10, 11. *Patella (Cymbula) miniata* Born, 1778. Fig. 10. False Bay, South Africa. Fig. 11. Port Elizabeth, South Africa; beach shells bleach to bright pink.
 Figs. 12-14. *Patella (Olava) cochlear* Born, 1778. Sea Point, South Africa. Anterior end always constricted like a spout.

vidence are *Cellana carpentariana* Skwarko, 1966, from the late Neocomian lower Cretaceous of Northern Territory, Australia, and *Patella (Scutellastra) cooperi* (Powell, 1938) from the Otaian Stage, lower Miocene of Motuihi Island, Auckland, New Zealand.

The above two records show at least that the separation of *Patella* and *Cellana* is of long standing, and coupled with the radular divergence, justifies Thiele's division of the family into two subfamilies, the Patellinae Rafinesque, 1815, and the Nacellinae Thiele, 1929.

Doubtful species of Patellidae

Patella ? *amuritica* Wilckens, 1922

Range—New Zealand, Amuri Bluff, upper Cretaceous.

Remarks—This species is based upon a very damaged and incomplete shell only 5 mm. in length. The whole of the apical area is missing and only a ring of shelly material remains. Even Wilckens expressed doubt as to whether his generic determination was correct.

Synonymy—

1922 *Patella* ? *amuritica* Wilckens, N. Z. Geol. Surv. Pal. Bull. no. 9, p. 5, pl. 1, fig. 8.

Patella guineensis Dunker, 1853

Remarks—The present writer has insufficient West African material to evaluate Dunker's species, the name of which is preoccupied by *Patella guineensis* Gmelin, 1791.

Synonymy—

1853 *Patella guineensis* Dunker, Ind. Moll. Guin. Infer., p. 40, pl. 7, figs. 1-3; 19-21. Loanda, Guinea, West Africa [Angola].

Cellana jutsoni Chapman and Crespini, 1934

Remarks—This species, from the lower Miocene Plantagenet Beds of Albany, Western Australia, is very doubtfully patellid. The presence of an "obscure ridge, extending from the apex to the posterior margin" suggests the fissurellid genus *Tugali* or something akin to it.

Synonymy—

1934 "*Cellana*" *jutsoni* Chapman & Crespini, Journ. Roy. Soc. West. Aust., vol. 20, p. 122, pl. 11, fig. 28.

Patella aspera Röding, 1798

(Pl. 63, fig. 4; pl. 68, figs. 3, 4)

Range—British Isles and Atlantic coast of France.

Remarks—This "species" is not always readily distinguished from *vulgata*. Typically it is more elongated than *vulgata*, depressed, with the apex nearer to the anterior end, and the primary ribs are stronger and sharper, resulting in a more definitely corrugated margin. Other differences are that the interior is porcellanous whitish, with the head scar pale orange, radial colour lines are sub-obsolete to obsolete, and the colour of the foot of the animal is cream to orange, as opposed to grey-green in *vulgata*.

Measurements (mm.)—

length	width	height	
53.0	42.0	21.0	Caldy Id., South Wales
47.0	35.5	20.0	Caldy Id., South Wales

Synonymy—

1798 *Patella aspera* Röding, Mus. Bolten., vol. 2, p. 10 (refers to Favanne, pl. 2, f. G).

1819 *Patella aspera* Lamarck, Anim. sans Vert., vol. 6, p. 327 (refers to Favanne, pl. 2, f. G).

1844 *Patella athletica* Bean, in Thorpe, Brit. Mar. Conch., p. 264, fig. 101).

1968 *Patella aspera* Lam., McMillan, Brit. Shells, Warne & Co. Ltd., London. New York, p. 25, pl. 1, figs. 1, 3, 4.

Patella depressa Pennant, 1777

Range—South coast of England, Channel Islands and Atlantic coast of France.

Remarks—This is the small, very depressed, *Siphonaria*-like species, or form of *vulgata*, of which *Patella vulgata* var. *intermedia* Jeffreys, 1865 is a synonym. Jeffreys described his variety *intermedia* as "Shell rather smaller, flatter, and oval, with finer ribs, and an orange crown; inside golden-yellow or tinged with flesh colour (occasionally cream colour) in the centre, and beautifully rayed toward the margin." Forbes also remarked that the animal is black or dark-coloured.

Despite the detailed studies of both Fischer-Piette and R. G. Evans, the taxonomic status of both *aspera* and *depressa* in relation to *vulgata* is still uncertain. Evans endeavoured to separate the three as full species, upon minute differences in the pluricuspid radula teeth, coupled with the varying lengths of the radula for each. In dealing with populations from the south of England Evans admitted, that at the Isle of Wight, intermediate forms were common but then remarked that to the westward along the south coast three species form discontinuous entities.

Synonymy—

- 1777 *Patella depressa* Pennant, Brit. Zool., vol. 4, p. 124, pl. 89, fig. 146.
 1865 *Patella, vulgata* var. *intermedia* Jeffreys, Brit. Conch. vol. 3, p. 237.
 1923 *Patella depressa* Pennant, Tomlin, Journ. Conch., vol. 17, p. 34.
 1935 *Patella* spp. Fischer-Piette, Systematique et biogeographie-Les Patelles d'Europe et d'Afrique du Nord. Journ. Conchyl., vol. 79, pp. 5-66.
 1952 *Patella depressa* Pennant, Evans, Proc. Zool. Soc., Lond., pp. 357-376.

Patella electrina Reeve, 1854

Remarks—This shell, described as coming from Australia, is unlike any species known from that area. Examination of the type specimen in the British Museum (Natural History) revealed a *Patella* of the *caerulea* series, very like the Canary Islands *Patella louei* d'Orbigny, so far as one can judge from a single example.

Synonymy—

- 1854 *Patella electrina* Reeve, Conch. Iconica, pl. 22, fig. 55a, b.

Patella intermedia

Many writers have attempted to give taxonomic status to the forms of both *vulgata* and *caerulea* by providing detailed studies of the radulae, particularly its length in relation to that of the shell (see also, under the heading "Radula," in the introduction), in small differences in the pluriscupid laterals, and also in the colour of the foot of the animal.

Unfortunately with many of these papers it is difficult to correlate the results with the species or forms investigated, due to a common fault of many anatomists of placing little or no importance upon the characters of the shell, and seldom illustrating the relevant shells.

Another source of confusion is in the nomenclature employed, specific names being frequently cited without their respective authority and date. A name that is quoted frequently, and around which most useful data is associated is "*intermedia*," but which patellid of that name is intended?—that of Knapp, 1857, Jeffreys, 1865, or Bucquoy, Dautzenberg and Dollfus, 1882?

Brian and Owen (1952) endeavoured to rectify this confusion by concluding that *P. intermedia* Jeffreys, 1865, as used by Fischer-Piette (1935, 1938 and 1948), Eslick (1940) and Orton (1946) was *Patella depressa* Pennant, 1777. They also concluded that *P. athletica* Bean, 1844, as used

in the Plymouth Marine Fauna (1931) and by Winckworth (1932) and Evans (1947) and *P. depressa*, as used by Fischer-Piette (1935), Eslick (1940) and Orton (1946) were all *Patella aspera* Lamarck (now *aspera* Röding, 1798).

The earliest use of the name *intermedia*, in association with *Patella*, is that of Knapp, in Murray, 1857, proposed for a Channel Islands shell, that appears to be a form of *Patella vulgata* Linnaeus, 1758.

Patella lineata Lamarck, 1819

Remarks—This shell, from unknown locality, was referred to *Helcioniscus* (now *Cellana*) by Pilsbry, but Delessert's figures suggest a species of the Acmaeidae. Pilsbry's translation of Lamarck's description follows:

Description—"Shell oval, convex, buff-brown, painted with 10-12 yellow lines; excessively numerous longitudinal close striae; vertex acute, buff. Length exceeding one inch." - 27 mm. (Mermod).

Synonymy—

- 1819 *Patella lineata* Lamarck, Anim. sans vert., vol. 6 (1), p. 331; *Patella lineata* Delessert, Rec. de Coq., pl. 23, fig. 6.
 1891 *Helcioniscus lineatus* Lamarck, Pilsbry, Man. of Conch., vol. 13, p. 153, pl. 73, figs. 85-87.
 1950 *Patella lineata* Lamarck, Mermod, Revue Suisse de Zool., vol. 57, no. 34, p. 694 (remarks on the type).

? Patella nelsonensis Trechmann, 1918

Range—Nelson, New Zealand, lower conglomerates, lower slopes of range, upper end of Eighty-eight Valley, Kaihikuan Stage, middle Triassic.

Remarks—The holotype and two paratypes are in the New Zealand Geological Survey, Wellington, but the preservation is not good enough to show muscle scars, hence it cannot be determined, on the present material, whether the apex is directed anteriorly or posteriorly. The species remains a doubtful member of the Patellacea.

Synonymy—

- 1918 *Patella* (?) *nelsonensis* Trechmann, Quart. J. Geol. Soc., vol. 73, pt. 3, p. 185, pl. 18, figs. 8 a, b.
 1953 *Patella nelsonensis* Trechmann, Marwick, N. Z. Geol. Surv. Pal. Bull. no. 21, p. 74, pl. 7, fig. 3.

Patella reussi K. Martin, 1879

Remarks—This species from the Miocene of Java could be fissurellid. The figure shows a shell embedded in matrix, and in consequence the interior

of the shell, with its muscle impressions, is unknown.

Synonymy—

1879 *Patella reussi* K. Martin, Die Tert. auf Java, Leiden, p. 87, pl. 12, fig. 9.

Patella spectabilis Dunker, 1853

Remarks—The description and figures of Dunker's species suggest a form of *Patella lowei* d'Orbigny, 1839. However, Dunker's name is preoccupied by *Patella spectabilis* Gmelin, 1791.

Synonymy—

1853 *Patella spectabilis* Dunker, Ind. Moll. Guin. Infer., p. 39, pl. 6, figs. 7-9. Loanda, Guinea, West Africa [Angola].

Species no longer included in the Patellidae

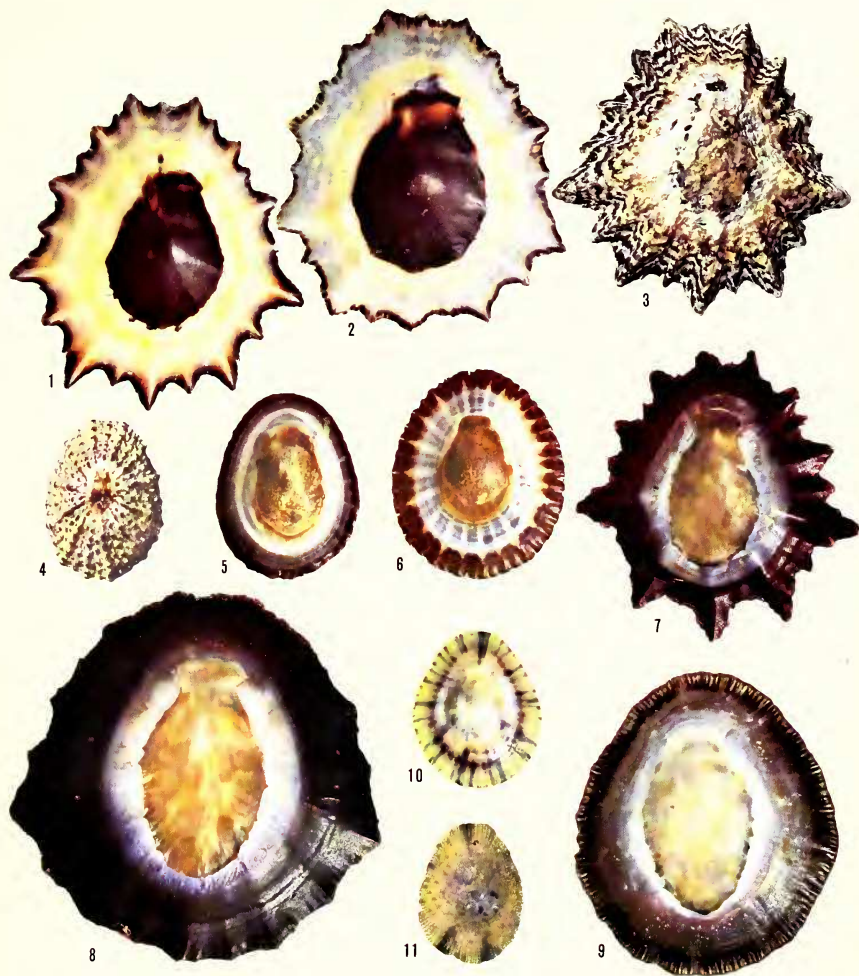
The following species, originally referred to the Patellidae, are now known to belong to other families. This list includes only species that the writer has been able to evaluate, either personally, or upon the authority of subsequent revisers. There remains a considerable number of patellid names yet to investigate, but since many of these have been inadequately described, seldom figured, and often without locality data, it is probable that most, eventually, will have to be considered indeterminate.

Species prefixed by an asterisk (*) are the subject of a note at the conclusion of this section.

The writer has compiled a manuscript list of over 1,250 patellid names encountered in the preparation of the present work, but it is withheld from publication at this stage, since it cannot be considered reasonably complete, without a more thorough appraisal of European species, the fossil ones in particular. A dagger (†) precedes fossil species in this list.

<i>achates</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>acmaees</i> Lea, 1846, <i>Patella</i>	? Pholadidae
<i>aculeata</i> Gmelin, 1791, <i>Patella</i>	Calyptraeidae
<i>adunca</i> Perry, 1811, <i>Patella</i>	Fissurellidae
<i>aenigmatica</i> Mabilbe, 1895, <i>Patella</i>	Acmaeidae
<i>aeruginosa</i> Middendorff, 1847, <i>Patella</i> (Acmaea) ...	Acmaeidae
<i>afra</i> Gmelin, 1791, <i>Patella</i>	Trinuschidae
<i>albescens</i> Anton, 1839, <i>Patella</i>	Acmaeidae
<i>allicostata</i> C. B. Adams, 1855, <i>Patella</i>	Acmaeidae
<i>allicostata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>allicostata</i> Angas, 1865, <i>Patella</i>	Acmaeidae
<i>alveus</i> Conrad, 1831, <i>Patella</i>	Acmaeidae
<i>ambigua</i> Wood, 1818, <i>Patella</i>	Fissurellidae
<i>amoena</i> Say, 1822, <i>Patella</i>	Acmaeidae
<i>ancyoides</i> E. Forbes, 1840, <i>Patella</i>	Lepetidae
<i>ancyoides</i> Middendorff, 1847, <i>Patella</i> (Acmaea) ...	Acmaeidae
<i>angulata</i> Wood, 1828, <i>Patella</i>	Calyptraeidae
<i>angusta</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae

<i>antillarum</i> Philippi, 1849, <i>Patella</i> (Acmaea)	Acmaeidae
<i>antiquata</i> Linnaeus, 1767, <i>Patella</i>	Hipponicidae
<i>apertura</i> Montagu, 1803, <i>Patella</i>	Fissurellidae
<i>araneosa</i> Gould, 1848, <i>Patella</i>	Acmaeidae
<i>araneosa</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>araneosa</i> d'Orbigny, 1841, <i>Patella</i>	Acmaeidae
<i>asni</i> Middendorff, 1847, <i>Patella</i>	Acmaeidae
<i>atriepalia</i> Dillwyn, 1817, <i>Patella</i>	Fissurellidae
<i>auricula</i> Gmelin, 1791, <i>Patella</i>	Calyptraeidae
<i>auricula</i> W. Wood, 1828, <i>Patella</i>	Stomatellidae
<i>australis</i> Lamarck, 1819, <i>Patella</i>	Hipponicidae
<i>avellana</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>axiaerata</i> Verco, 1912, <i>Patella</i>	Acmaeidae
<i>balanoides</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>barbadensis</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>biradiata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>bornensis</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>borniana</i> Helbling, 1779, <i>Patella</i>	Acmaeidae
<i>caeca</i> Müller, 1776, <i>Patella</i>	Lepetidae
<i>calanus</i> Crosse & Fischer, 1864, <i>Patella</i>	Acmaeidae
<i>callosa</i> Hombron & Jacquinot, 1841, <i>Patella</i>	Acmaeidae
<i>campaniformis</i> Blainville, 1825, <i>Patella</i>	? Siphonariidae
<i>campbelli</i> Filhol, 1880, <i>Patella</i>	Acmaeidae
<i>cancellata</i> Gmelin, 1791, <i>Patella</i>	Acmaeidae
<i>candida</i> Conthouy, 1838, <i>Patella</i>	Lepetidae
<i>cantharus</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>cassida</i> Dillwyn, 1817, <i>Patella</i>	Hipponicidae
<i>casta</i> Carpenter, 1866, <i>Nacella</i>	Acmaeidae
<i>ceciliana</i> d'Orbigny, 1841, <i>Patella</i>	Acmaeidae
<i>cerea</i> Möller, 1842, <i>Patella</i>	Lepetidae
<i>chilensis</i> Blainville, 1825, <i>Patella</i>	? Siphonariidae
<i>chinensis</i> Linnaeus, 1758, <i>Patella</i>	Calyptraeidae
<i>cinclata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>cinis</i> Reeve, 1854, <i>Patella</i>	Acmaeidae
<i>cinnamomea</i> Gould, 1846, <i>Patella</i>	Phenacolepidae
<i>clealandi</i> J. Sowerby, 1822, <i>Patella</i>	Acmaeidae
<i>clypeus</i> T. Brown, 1827, <i>Patella</i>	Acmaeidae
<i>cochleata</i> Dillwyn, 1817,	Capulidae
<i>coffeae</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>compressuscula</i> Karsten, 1849, <i>Patella</i>	Acmaeidae
<i>concentrica</i> Middendorff, 1851, <i>Patella</i>	Lepetidae
<i>conceptionis</i> Lesson, 1831, <i>Patella</i>	Acmaeidae
<i>concinna</i> Lischke, 1870, <i>Patella</i>	Acmaeidae
<i>conica</i> DeFrance, 1825, <i>Patella</i>	Acmaeidae
<i>conica</i> Gould, 1846, <i>Patella</i>	Acmaeidae
<i>conulus</i> Dunker, 1882, <i>Patella</i>	Acmaeidae
<i>corrugata</i> Reeve, 1854, <i>Patella</i>	Acmaeidae
<i>cranialis</i> Röding, 1798, <i>Patella</i>	Fissurellidae
<i>crebriata</i> Verco, 1904, <i>Nacella</i>	Acmaeidae
<i>crepidula</i> Linnaeus, 1764, <i>Patella</i>	Calyptraeidae
<i>cruciata</i> Linnaeus, 1758, <i>Patella</i>	Acmaeidae
<i>crystallina</i> W. Wood, 1828, <i>Patella</i>	Fissurellidae
<i>eubensis</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>cumingii</i> Reeve, 1854, <i>Patella</i>	Acmaeidae
<i>diaphana</i> Reeve, 1854, <i>Patella</i>	Acmaeidae
<i>dichotoma</i> Anton, 1839, <i>Patella</i>	Acmaeidae
<i>digitale</i> Röding, 1798, <i>Patella</i>	Acmaeidae
<i>discors</i> Philippi, 1849, <i>Patella</i> (Acmaea)	Acmaeidae
<i>elegans</i> Philippi, 1849, <i>Patella</i>	Acmaeidae
<i>emarginuloides</i> Philippi, 1868, <i>Patella</i>	Lepetidae
<i>equestris</i> Linnaeus, 1758, <i>Patella</i>	Calyptraeidae
<i>exilis</i> Philippi, 1849, <i>Patella</i>	Acmaeidae
<i>fenestrata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>fimbriata</i> Gould, 1846, <i>Patella</i>	Acmaeidae
<i>fissura</i> Linnaeus, 1758, <i>Patella</i>	Fissurellidae
<i>fissurata</i> Dillwyn, 1817, <i>Patella</i>	Fissurellidae
<i>fissurella</i> O. F. Müller, 1776, <i>Patella</i>	Fissurellidae
<i>floccata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>fluviatilis</i> Gmelin, 1791, <i>Patella</i>	Aneylidae
<i>forbesii</i> J. Smith, 1839, <i>Patella</i>	Lepetidae
<i>formicata</i> Linnaeus, 1758, <i>Patella</i>	Calyptraeidae
<i>fulva</i> O. F. Müller, 1776, <i>Patella</i>	Lepetidae
<i>fungoides</i> Röding, 1798, <i>Patella</i>	Acmaeidae

Plate 64. South African *Patella*

Figs. 1-3. *Patella (Patellona) granatina* Linnaeus, 1758. Sea Point, South Africa.

Figs. 4-6. *Patella (Patellidea) granularis* Linnaeus, 1758. Sea Point, South Africa.

Figs. 7-9. *Patella (Patellona) oculus* Born, 1778. Buffel's Bay, Cape Peninsula, South Africa.

Figs. 10-11. *Patella concolor* Krauss, 1848. Near Durban, Natal.

<i>galathea</i> Lamarck, 1819, <i>Patella</i>	Phenacolepadidae	<i>onychites</i> Menke, 1843, <i>Patella</i>	Acmaeidae
<i>goreensis</i> Gmelin, 1791, <i>Patella</i>	Calyptraeidae	<i>fopea</i> Reeve, 1854, <i>Patella</i>	Acmaeidae
<i>graeca</i> Linnaeus, 1758, <i>Patella</i>	Fissurellidae	<i>oregona</i> Nuttall, 1839, <i>Patella</i>	Acmaeidae
<i>grammia</i> Philippi, 1847, <i>Patella</i>	Acmaeidae	<i>pallescens</i> Philippi, 1849, <i>Patella</i> (Acmaea)	Acmaeidae
<i>granostriata</i> Schrenck, 1867, <i>Patella</i>	Acmaeidae	<i>ipallida</i> Gould, 1859, <i>Patella</i>	Acmaeidae
<i>granulata</i> Philippi, 1848, <i>Patella</i>	Acmaeidae	<i>papillaris</i> Röding, 1798, <i>Patella</i>	Acmaeidae
<i>grisea</i> Gmelin, 1791, <i>Patella</i>	Siphonariidae	<i>parasitica</i> d'Orbigny, 1841, <i>Patella</i>	Acmaeidae
<i>grisea</i> Röding, 1798, <i>Patella</i>	Fissurellidae	<i>parva</i> da Costa, 1778, <i>Patella</i>	Acmaeidae
<i>halitoides</i> Röding, 1798, <i>Patella</i>	Calyptraeidae	<i>patina</i> Eschscholtz, 1847, <i>Patella</i> (Acmaea)	Acmaeidae
<i>habetica</i> Pritchard & Gatliff, 1903, <i>Patella</i>	Acmaeidae	<i>pectinata</i> Linnaeus, 1758, <i>Patella</i>	Siphonariidae
<i>heptagona</i> Blainville, 1825, <i>Patella</i>	Acmaeidae	<i>pediculos</i> Philippi, 1846, <i>Patella</i>	Acmaeidae
<i>heroldi</i> Dunker, 1852, <i>Patella</i>	Acmaeidae	<i>petioides</i> Carpenter, 1864, <i>Nacella</i>	Siphonariidae
<i>hiantula</i> W. Wood, 1828, <i>Patella</i>	Fissurellidae	<i>penicillata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
* <i>hochstetteri</i> K. Martin, 1879, <i>Patella</i>	Fissurellidae	<i>perforata</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>incisa</i> Dillwyn, 1817, <i>Patella</i>	Fissurellidae	<i>persona</i> Eschscholtz, 1847, <i>Patella</i> (Acmaea)	Acmaeidae
<i>inconspicua</i> Gray, 1843, <i>Patella</i>	Acmaeidae	<i>personata</i> T. Martyn, 1788, <i>Patella</i> (non binom.)	Fissurellidae
<i>indica</i> W. Wood, 1828, <i>Patella</i>	Umbraculidae	<i>perversa</i> Gmelin, 1791, <i>Patella</i>	Umbraculidae
<i>inradiata</i> Reeve, 1855, <i>Patella</i>	? Acmaeidae	<i>personoides</i> Middendorff, 1849, <i>Patella</i> (Acmaea)	Acmaeidae
<i>insecta</i> Hinds, 1842, <i>Patella</i>	Acmaeidae	<i>peziza</i> W. Wood, 1828, <i>Patella</i>	Calyptraeidae
<i>insignis</i> Menke, 1843, <i>Patella</i>	Acmaeidae	<i>phyrozonias</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>instabilis</i> Gould, 1846, <i>Patella</i>	Acmaeidae	<i>phoca</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>intertexta</i> Röding, 1798, <i>Patella</i>	Acmaeidae	<i>pileolus</i> Dillwyn, 1817, <i>Patella</i>	Fissurellidae
<i>jacksoniensis</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>pileolus</i> Middendorff, 1849, <i>Patella</i> (Acmaea)	Acmaeidae
<i>jamaicensis</i> Gmelin, 1791, <i>Patella</i> p. 3715	Acmaeidae	<i>plana</i> Philippi, 1849, <i>Patella</i>	Acmaeidae
<i>jamaicensis</i> Gmelin, 1791, <i>Patella</i> , p. 3730	Fissurellidae	<i>plana</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>javânica</i> Lamarck, 1819, <i>Patella</i>	Siphonariidae	<i>poctum</i> W. Wood, 1828, <i>Patella</i>	Calyptraeidae
<i>kochi</i> Philippi, 1849, <i>Patella</i>	Acmaeidae	<i>pretrei</i> d'Orbigny, 1841, <i>Patella</i>	Acmaeidae
<i>laciniata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>profunda</i> Deshayes, 1863, <i>Patella</i>	Acmaeidae
<i>laciniosa</i> Linnaeus, 1758, <i>Patella</i>	Siphonariidae	<i>proutissimula</i> Philippi, 1849, <i>Patella</i>	Acmaeidae
<i>lacunosa</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>punctulata</i> Gmelin, 1791, <i>Patella</i>	Acmaeidae
<i>lacustris</i> Linnaeus, 1758, <i>Patella</i>	Ancylidae	<i>puncturata</i> Lamarck, 1819, <i>Patella</i>	Acmaeidae
<i>lamanonii</i> Schrenck, 1867, <i>Patella</i>	Acmaeidae	<i>pustula</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>lamy</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>pustulata</i> Helbing, 1779, <i>Patella</i>	Acmaeidae
<i>laqueare</i> W. Wood, 1828, <i>Patella</i>	? Acmaeidae	<i>pygmaea</i> Dunker, 1852, <i>Patella</i>	Acmaeidae
<i>latistrigata</i> Angus, 1865, <i>Patella</i>	Acmaeidae	<i>rosea</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>leatiginosa</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>rosea</i> Dall, 1872, <i>Nacella</i> ?	Acmaeidae
<i>lepa</i> Gmelin, 1791, <i>Patella</i>	Muricidae (Thaidinae)	<i>roseoradiata</i> Verco, 1912, <i>Nacella crebrestriata</i>	Acmaeidae
<i>leucophaea</i> Philippi, 1849, <i>Patella</i>	Acmaeidae	<i>rubella</i> O. Fabricius, 1780, <i>Patella</i>	Acmaeidae
<i>leucopleura</i> Gmelin, 1791, <i>Patella</i>	Acmaeidae	<i>rubicola</i> Röding, 1798, <i>Patella</i>	Fissurellidae
<i>leucopleura</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>rudis</i> Röding, 1798, <i>Patella</i>	Fissurellidae
<i>lima</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>rugosa</i> Röding, 1798, <i>Patella</i>	Capulidae
<i>limbata</i> Röding, 1798, <i>Patella</i>	Fissurellidae	<i>saccharina</i> Linnaeus, 1758, <i>Patella</i>	Acmaeidae
<i>limcata</i> Philippi, 1849, <i>Patella</i>	Acmaeidae	<i>scabra</i> Gould, 1846, <i>Patella</i> (Lottia)	Acmaeidae
* <i>luhana</i> Pilsbry, 1901, <i>Patella</i>	Acmaeidae	<i>scabra</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>luctuosa</i> Hombron & Jacquinot, 1841, <i>Patella</i>	Acmaeidae	<i>scapula</i> Martyn, 1789, <i>Patella</i> (non binom.)	Aplysiidae
<i>lutea</i> Linnaeus, 1758, <i>Patella</i>	Stomatellidae	<i>schrenckii</i> Lischke, 1868, <i>Patella</i>	Acmaeidae
<i>macrochisma</i> Lightfoot, 1786, <i>Patella</i>	Fissurellidae	<i>scurra</i> Lesson, 1831, <i>Patella</i>	Acmaeidae
<i>macrochisma</i> Dillwyn, 1817, <i>Patella</i>	Fissurellidae	<i>scutellata</i> W. Wood, 1828, <i>Patella</i>	Calyptraeidae
<i>mamillata</i> (Nuttall) Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>senilis</i> Röding, 1798, <i>Patella</i>	Umbraculidae
<i>mauritanica</i> Pilsbry, 1891, <i>Helcioniscus</i>	Acmaeidae	<i>siemensis</i> Gmelin, 1791, <i>Patella</i>	Calyptraeidae
<i>melanoleuca</i> Gmelin, 1791, <i>Patella</i>	Acmaeidae	<i>sinica</i> Gmelin, 1791, <i>Patella</i>	Umbraculidae
<i>melanoleuca</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>sinosa</i> Brocchi, 1814, <i>Patella</i>	Capulidae
<i>mercaeani</i> Deshayes, 1861, <i>Patella</i>	Acmaeidae	<i>solandri</i> Colenso, 1844, <i>Patella</i>	Acmaeidae
<i>minima</i> Gmelin, 1791, <i>Patella</i>	? Acmaeidae	<i>spectrum</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>nitella</i> Röding, 1798, <i>Patella</i>	Fissurellidae	<i>spinosa</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae
<i>mixta</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>squamulata</i> Renier, 1804, <i>Patella</i>	Calyptraeidae
<i>mülleri</i> Dunker, 1875, <i>Patella</i> (Tectura)	Acmaeidae	<i>stella</i> Lesson, 1831, <i>Patella</i>	Acmaeidae
<i>nuricata</i> Brocchi, 1814, <i>Patella</i>	Calyptraeidae	<i>stellaris</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>nytiliformis</i> Gmelin, 1791, <i>Patella</i>	Calyptraeidae	<i>stipulata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
<i>navicula</i> Reeve, 1854, <i>Patella</i>	Acmaeidae	<i>stovae</i> Verco, 1906, <i>Nacella</i>	Acmaeidae
<i>neptuni</i> Dillwyn, 1817, <i>Patella</i>	Calyptraeidae	<i>striata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae
* <i>nigrosulcata</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>stunus</i> Hombron & Jacquinot, 1841, <i>Patella</i>	Acmaeidae
<i>nimbosa</i> Linnaeus, 1758, <i>Patella</i>	Fissurellidae	<i>subspiralis</i> Carpenter, 1864, <i>Nacella</i>	Siphonariidae
<i>noachina</i> Linnaeus, 1771, <i>Patella</i>	Fissurellidae	<i>sulcata</i> Borson, 1820, <i>Patella</i>	Hipponicidae
<i>nodosa</i> Born, 1778, <i>Patella</i>	Fissurellidae	<i>tectum</i> Dillwyn, 1817, <i>Patella</i>	Calyptraeidae
<i>notata</i> Linnaeus, 1758, <i>Patella</i>	Fissurellidae	<i>tectumchinensis</i> Röding, 1798, <i>Patella</i>	Calyptraeidae
<i>nubecula</i> Linnaeus, 1758, <i>Patella</i>	Fissurellidae	<i>tenera</i> C. B. Adams, 1845, <i>Patella</i>	Acmaeidae
<i>nummularis</i> Röding, 1798, <i>Patella</i>	Fissurellidae	<i>tenuicostata</i> Michelin, 1838, <i>Patella</i>	Acmaeidae
<i>nuttalliana</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>tesellata</i> O. F. Müller, 1779, <i>Patella</i>	Acmaeidae
<i>obliquata</i> Koenen, 1892, <i>Patella</i> (Acmaea)	? Cocculimidae	<i>testudinalis</i> O. F. Müller, 1776, <i>Patella</i>	Acmaeidae
<i>obscura</i> Hombron & Jacquinot, 1841, <i>Patella</i>	Acmaeidae	<i>textilis</i> Gould, 1846, <i>Patella</i> (Lottia)	Acmaeidae
<i>occidentalis</i> Reeve, 1855, <i>Patella</i>	Acmaeidae	<i>tranquebarica</i> Gmelin, 1791, <i>Patella</i>	Acmaeidae
<i>ocoradiata</i> Gmelin, 1791, <i>Patella</i>	Fissurellidae	<i>triangularis</i> Carpenter, 1866, <i>Nacella paleacea</i>	Acmaeidae

tricarinata Linnaeus, 1767, Patella	Hipponicidae
tricostata Gmelin, 1791, Patella	Hipponicidae
trochiformis Gmelin, 1791, Patella	Calyptraeidae
trochoides Dillwyn, 1817, Patella	Calyptraeidae
tuberculifera Lamarck, 1819, Patella	? Siphonariidae
turcica Röding, 1798, Patella	Calyptraeidae
umbellata Gmelin, 1791, Patella	Umbraculidae
umbellata della Chiaje, 1830, Patella	Umbraculidae
umbonata Reeve, 1855, Patella	Acmaeidae
uncinata Reeve, 1855, Patella	Acmaeidae
undulata Röding, 1798, Patella	Calyptraeidae
ungarica Linnaeus, 1758, Patella	Capulididae
unguis Linnaeus, 1758, Patella	Fissurellidae
unguis J. Sowerby, 1816, Patella	Capulididae
unguisaluae Lesson, 1831, Patella	Acmaeidae
verruculata Reeve, 1855, Patella	Acmaeidae
vespertina Reeve, 1855, Patella	Acmaeidae
victoriae Catliff & Gabriel, 1922, Patella	Acmaeidae
victoriana Singleton, 1937, Patella	Acmaeidae
virginea O. F. Müller, 1776, Patella	Acmaeidae
viridula Lamarck, 1819, Patella	Acmaeidae
zebrina Lesson, 1831, Patella	Acmaeidae

Synonymy—

- 1855 *Patella nigrosulcata* Reeve, Conch. Iconica, pl. 30, figs. 84 a, b.
 1891 *Patella (Scutellastra) stellaeformis* var. *nigrosulcata* Reeve, Pilsbry, Man. of Conch., vol. 13, p. 100, pl. 66, figs. 66, 67.
 1955 *Patelloida nigrosulcata* Reeve, Macpherson, Proc. Royal Society of Victoria, vol. 67 (2), p. 241.

Patella opea Reeve, 1854

Remarks—Dr. Myra Keen has shown that the originally cited locality for this species, "Sandwich Islands" - Hawaii, is incorrect, and that the species is a synonym of the West American *Acmaea fascicularis* Menke, 1851.

Synonymy—

- 1854 *Patella opea* Reeve, Conch. Iconica, pl. 29, figs. 79 a, b.
 1958 *Acmaea fascicularis* Menke, Keen, Sea Shells of Tropical West America, p. 244.

Notes relevant to the above non-patellid species

Patella hochstetteri K. Martin, 1879

Remarks—This species, from the Miocene of Java, is a *Hemitoma*, family Fissurellidae; in fact its author likened it to *Hemitoma notata* (Linnaeus, 1758).

Synonymy—

- 1879 *Patella hochstetteri* K. Martin, Die tert. auf Java, Leiden, p. 86, pl. 12, fig. 10.

Patella luchuana Pilsbry, 1901

Remarks—Habe determined that the radula and gill structure of this Ryukyu Islands limpet prove it to belong to the Acmaeidae.

Synonymy—

- 1901 *Patella luchuana* Pilsbry, Proc. Acad. Nat. Sci. Phila., vol. 53, p. 202.
 1957 *Collisella luchuana* Pilsbry, Habe, Proc. Malac. Soc. Lond., vol. 32, p. 207.

Patella nigrosulcata Reeve, 1855

Remarks—This shell, described from unknown locality, has since been identified as a Western Australian *Patelloida*, family Acmaeidae, and thus has nothing to do with *Patella (Scutellastra) stellaeformis*, where it was assigned as a variety by Pilsbry, 1891. The species is usually found attached to the backs of large *Patella (Scutellastra) laticostata* Blainville.

Patella pallida Gould, 1859

Remarks—This Recent Japanese species is now recognised as belonging to the Acmaeidae.

Synonymy—

- 1859 *Patella pallida* Gould, Proc. Boston Soc. Nat. Hist., vol. 7, p. 162.
 1952 *Tectura pallida* Gould, Kuroda & Habe, Check List Rec. Mar. Moll. Japan, p. 89.

Patella profunda Deshayes, 1863

Remarks—This Recent Reunion Island species is now known to belong to the Acmaeidae.

Synonymy—

- 1863 *Patella profunda* Deshayes, Moll. Réunion, p. 44, pl. 6, figs. 15, 16.
 1942 *Patelloida profunda* Deshayes, Tomlin & Stephenson, Proc. Malac. Soc., London, vol. 25, p. 6.

Helcioniscus profundus var. mauritiana Pilsbry, 1891

Remarks—This Recent species and its variety from the island of Mauritius belong to the Acmaeidae.

Synonymy—

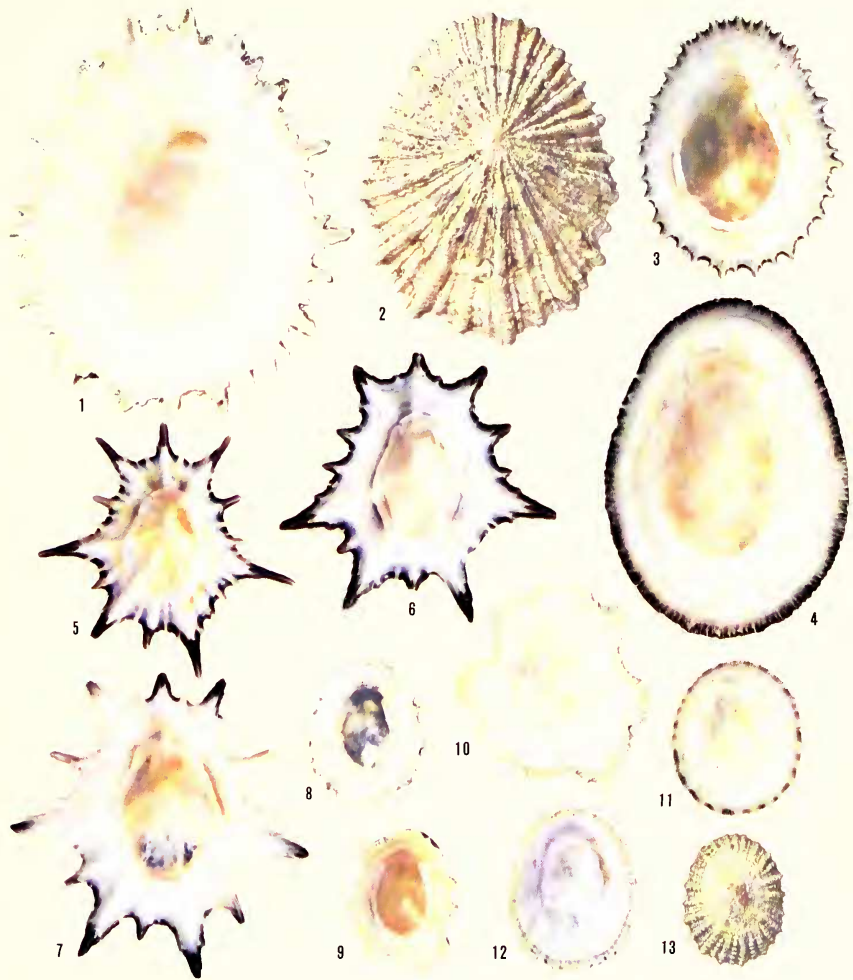
- 1891 *Helcioniscus profundus* var. *mauritiana* Pilsbry, 1891, Manual of Conchology, vol. 13, p. 150, pl. 65, figs. 97-99.

List of Recognized Taxa

SUBFAMILY **Patellinae**GENUS **Patella** Linnaeus, 1758Subgenus **Patella** Linnaeus, 1758*vulgata* Linnaeus, 1758. **Type.** Europe*aspera* Röding, 1798. Europe*depressa* Pennant, 1777. Europe*ferruginea* Gmelin, 1791. Mediterranean*baudonii* Drouet, 1858. Azores*rustica* Linnaeus, 1758. S. Europe-Mediterranean*piperata* Gould, 1846. Madeira and Cape Verde Ids.*caerulea* Linnaeus, 1758. Mediterranean, Portugal, Azores and Canary Ids.*moreleti* Drouet, 1858. Azores*lowei* d'Orbigny, 1839. Canary Ids.*gomesii* Drouet, 1858. Azores

Subgenus (not known)

candei d'Orbigny, 1839. Canary Ids.*citrullus* Gould, 1846. Madeira*concolor* Krauss, 1848. Natal and eastern South Africa*depsta* Reeve, 1855. St. Paul and Amsterdam Ids.*rangiana* Rochebrune, 1882. Cape Verde Ids.†*kaffraria* Rennie, 1930. Cretaceous, South AfricaSubgenus **Patellona** Thiele, in Troschel & Thiele, 1891*granatina* Linnaeus, 1758. **Type.** South Africa*oculus* Born, 1778. South Africa*adansonii* Dunker, 1853. West Africa*canescens* Gmelin, 1791. St. Helena*lugubris* Gmelin, 1791. West Africa and Cape Verde Ids.*plumbea* Lamarck, 1819. West Africa*saftana* Lamarck, 1819. Algeria to West AfricaSubgenus **Patellidea** Thiele, in Troschel & Thiele, 1891*granularis* Linnaeus, 1758. **Type.** South AfricaSubgenus **Cymbula** H. & A. Adams, 1854*compressa* Linnaeus, 1758. **Type.** South Africa*miniata* Born, 1778. South AfricaSubgenus **Olana** H. & A. Adams, 1854*cochlear* Born, 1778. **Type.** South AfricaSubgenus **Scutellastra** H. & A. Adams, 1854*argenvillei* Krauss, 1848. South Africa*barbara* Linnaeus, 1758. **Type.** South Africa*longicosta* Lamarck, 1819. South Africa*tabularis* Krauss, 1848. South Africa*exusta* Reeve, 1854. Mauritiussubsp. *pica* Reeve, 1854. Mauritius to Seychelles*flexuosa* Quoy & Gaimard, 1834. Indo-Pacific, Andamans to Tuamotussubsp. *optima* Pilsbry, 1927. Japan*kermadecensis* Pilsbry, 1894. Kermadec Ids.†*taurorae* Fleming, 1973. Middle Oligocene, New Zealand*tucoipiana* (Powell, 1925). Tikopia, Melanesia*laticostata* Blainville, 1825. south West Australia*peronii* Blainville, 1825. southern Australia*chapmani* Tenison Woods, 1875. South Australia to New South Wales†*hamiltonensis* (Chapman & Gabriel, 1923. Lower Pliocene, Australia†*cooperi* (Powell, 1938). Lower Miocene, New ZealandSubgenus **Ancistromesus** Dall, 1871*mexicana* Broderip & Sowerby, 1829. **Type.** West Mexico†*fuenzalidai* Herm, 1969. Pliocene, ChileGENUS **Helcion** Montfort, 1810Subgenus **Helcion** Montfort, 1810*pectunculus* (Gmelin, 1791). **Type.** South AfricaSubgenus **Ansates** Sowerby, 1839*pellucidus* (Linnaeus, 1758). **Type.** Western Europe? *tella* (Bergh, 1871). Sargasso SeaSubgenus **Patinastra** Thiele, in Troschel & Thiele, 1891*pruinus* (Krauss, 1848). **Type.** South Africa*dunkeri* (Krauss, 1848). South AfricaSUBFAMILY **Nacellinae**GENUS **Cellana** H. Adams, 1869*eucosmia* (Pilsbry, 1891). Red Sea*radiata* (Born, 1778). India to Philippinessubsp. *capensis* (Gmelin, 1791). Natal to Zanzibarsubsp. *enneagona* (Reeve, 1854). Madagascar to Japansubsp. *orientalis* (Pilsbry, 1891). Indonesia; Japan; Marquesas†*deformis* (K. Martin, 1883). Miocene, Java*karachiensis* (Winckworth, 1930). Gulf of Oman to Karachi*livescens* (Reeve, 1855). **Type.** Mauritius*pricei* Powell, **new species.** Samoa and New Hebrides*garconi* (Deshayes, 1863). Reunion and Madagascar

Plate 65. *Patella* of the subgenus *Scutellastra*

Figs. 1-3 *Patella (Scutellastra) barbata* Linnaeus, 1758.
 Figs. 1, 3. Buluga Bay, East London, South Africa. Fig. 2.
 Port Alfred, South Africa.
 Fig. 4. *Patella (Scutellastra) argenvillei* Krauss, 1848. Sea
 Point, South Africa.
 Figs. 5-7. *Patella (Scutellastra) longicosta* Lamarck, 1819.
 Kommetje, Cape Peninsula, South Africa.

Figs. 8-9. *Patella (Scutellastra) flexuosa* Quoy & Gaimard,
 1834. Fig. 8. Paea, Tahiti. Fig. 9. Wake Island.
 Fig. 10. *Patella (Scutellastra) flexuosa* subspecies *optima*
 Pilsbry, 1927. Waki, Satsuma, Japan; young example.
 Figs. 11-13. *Patella (Scutellastra) peronii* Blainville, 1825.
 Fig. 11. Swansea, Tasmania. Figs. 12-13. Shellharbour,
 New South Wales, Australia.

(Cellana cont'd)

- testudinaria* (Linnaeus, 1758). Andaman Ids. to New Caledonia
- vitiensis* Powell, **new name**. Fiji
- grata* (Gould, 1859). Japan and Korea
- mazatlantica* (Sowerby, 1839). Japan and Ryukyu Ids.
- nigrolineata* (Reeve, 1854). Japan
- toreuma* (Reeve, 1855). Japan to Philippines
- exarata* (Reeve, 1854). Hawaiian Ids.
- talcosa* (Gould, 1846). Hawaiian Ids.
- tahitensis* (Pease, 1868). Tahiti and Pitcairn
- ardosiacea* (Hombron & Jacquinot, 1841). Juan Fernandez Id.
- conciolata* Iredale, 1940. Queensland
- turbator* Iredale, 1940. South Queensland
- tramoserica* (Holten, 1802). South Queensland to South Australia
- solida* (Blainville, 1825). Tasmania to South Australia
- †*carpentariana* Skwarko, 1966. Lower Cretaceous, North Australia
- †*cadmorei* Chapman & Gabriel, 1923. Lower Miocene, Victoria
- †*hentyi* Chapman & Gabriel, 1923. Lower Pliocene, Victoria
- analogia* Iredale, 1940. Lord Howe Id.
- hovensisi* Iredale, 1940. Lord Howe Id.
- craticulata* (Suter, 1905). Kermadec Ids.
- denticulata* (Martyn, 1784). New Zealand
- flava* (Hutton, 1873). New Zealand
- ornata* (Dillwyn, 1817). New Zealand
- radians* (Gmelin, 1791). New Zealand
- stellifera* (Gmelin, 1791). New Zealand
- strigilis* (Hombron & Jacquinot, 1841). Auckland and Campbell Ids.
- subsp. *bollonsi* Powell, 1955. Antipodes Ids.
- subsp. *chathamensis* (Pilsbry, 1891). Chatham Ids.
- subsp. *flemingi* Powell, 1955. Snares Ids.
- subsp. *oliveri* Powell, 1955. Bounty Ids.
- subsp. *redimiculum* (Reeve, 1854). Southern New Zealand
- †*thomsoni* Powell & Bartrum, 1929. Lower Miocene, New Zealand
- †*cophina* Powell, **new species**. Lower Miocene, New Zealand
- taberna* Powell, **new species**. Lower Miocene, New Zealand
- GENUS *Nacella* Schumacher, 1817
- Subgenus *Nacella* Schumacher, 1817
- mytilina* (Helbling, 1779). **Type**. Southern Chile to Kerguelen Id.

kerguelensis (E. A. Smith, 1877). Kerguelen and Heard Ids.

Subgenus *Patinigera* Dall, 1905

- clypeator* (Lesson, 1831). Chile
- concinna* (Strebel, 1908). South Georgia to Antarctica
- deaurata* (Gmelin, 1791). Patagonia, Falklands, Tierra del Fuego
- subsp. *delicatissima* (Strebel, 1907). Magellan and Falklands
- delesserti* (Philippi, 1849). Marion Id.
- edgari* (Powell, 1957). Kerguelen Id.
- flammea* (Gmelin, 1791). Strait of Magellan
- fuegiensis* (Reeve, 1855). Magellan, Falklands, South Georgia
- magellanica* (Gmelin, 1791). **Type**. Magellan to Falklands
- subsp. *venosa* (Reeve, 1854). Chiloe Island, Chile
- macquariensis* Finlay, 1927. Macquarie and Heard Ids.
- terroris* (Filhol, 1880). Campbell Id.

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[These occasional blank areas occur between genera and subgenera to permit the insertion of new material and future sections in their proper systematic sequence.]

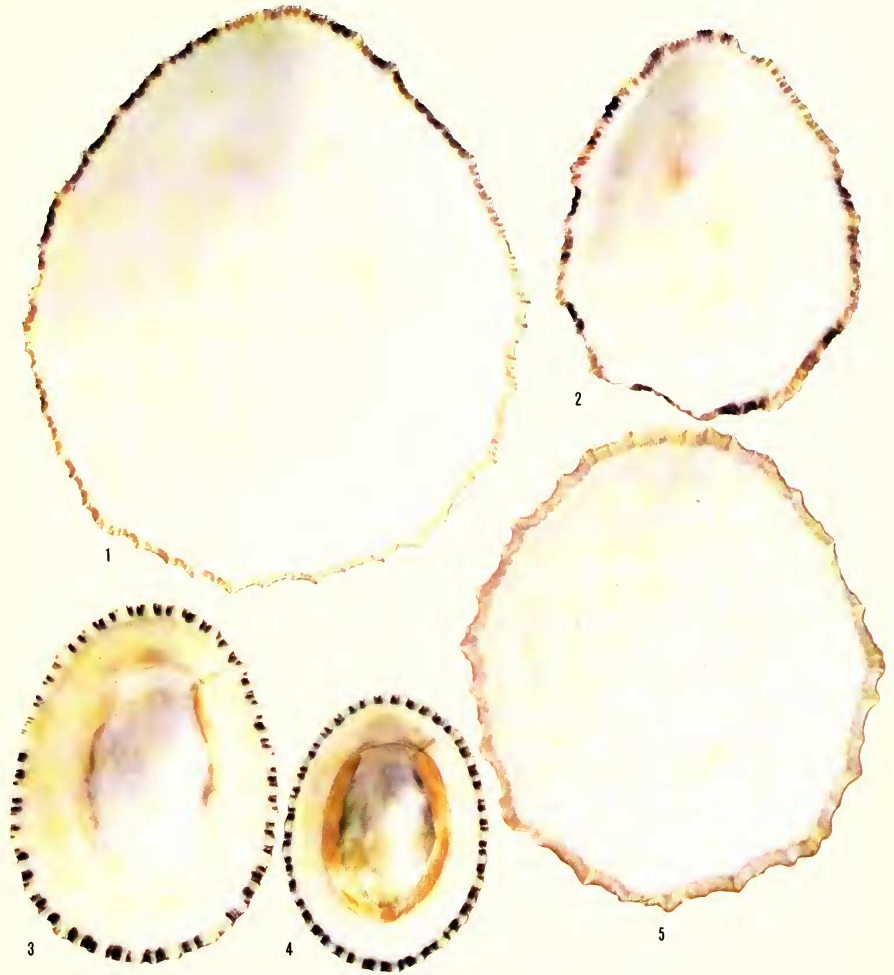


Plate 66 *Patella* of the subgenus *Scutellastra*

Fig. 1. *Patella (Scutellastra) kermadecensis* Pilsbry, 1894. Raoul Island, Kermadec Islands. Largest living species of the subgenus.

Fig. 2. *Patella (Scutellastra) flexuosa* subspecies *optima* Pilsbry, 1927. Yakushima, Japan.

Figs. 3-4. *Patella (Scutellastra) laticostata* Blainville, 1825. Albany, Western Australia.

Fig. 5. *Patella (Scutellastra) tabularis* Krauss, 1848. Cape Point, South Africa.

Family Patellidae Rafinesque 1815

The Patellidae or family of true limpets have simple, oval to rounded, conical or cap-shaped shells, without a perforation, marginal notch or internal septum. They are characteristic of the intertidal zone and seldom extend much below low-tide mark. A detailed account of the animal, its habits, functions, distribution and geological range, is given in the introductory section of this work.

Subfamily Patellinae Rafinesque, 1815

The subfamily Patellinae includes the genera *Patella* and *Helcion*, as well as several subgenera of each.

The radula comprises four identical central teeth, often with the addition of a median central that may vary from vestigial to fully developed. The lateral is large and pluricuspid, and is flanked by three weak, slender, apparently functionless marginals. The radular ribbon is relatively short, straight, and folded back upon itself at the nascent end.

The gill cordon is continuous in all members, except in typical *Helcion*, which has the cordon interrupted by the head, understandable in that instance, since the sole species, *pectunculus*, has the anterior end reduced almost to nothing.

The shell in *Patella* is usually rather solid, porcellanous within, and seldom iridescent. On the other hand, *Helcion* (*Patinastra*) is semitransparent, and *Cellana*-like, except for the dentition which closely resembles that of *Patella*.

The typical genus, *Patella*, is distributed along most of the eastern coast of Europe, from the Lofoten Islands, and including Britain, to Spain, the Mediterranean, west coast of Africa and offshore islands; also there is one species in Natal, and another, somewhat atypical, at the South Indian Ocean Islands of St. Paul and Amsterdam.

The subgenus *Patellona* is predominantly West African, but extends to South Africa; the subgenera *Cymbula* and *Olana* are exclusively South African; the subgenus *Scutellastra* is South African as well, but also has a very extensive Indo-Pacific range, and the subgenus *Ancistromesus*,

largest of all limpets, belongs exclusively to the west coast of Central America.

Numerous species, attributed to *Patella*, *Helcion* and *Nacella*, have been described from European Cretaceous and Tertiary horizons, but their true identity, of necessity based upon shell characters alone, is uncertain.

Genus *Patella* Linnaeus, 1758

Type: *Patella vulgata* Linnaeus, 1758

Shell ovate, conical or cap-shaped, with the apex subcentral, usually solid, and of medium size to very large. Sculpture consisting of radial ridges of varying strength, mostly crossed by concentric growth lines. Interior of shell varying from subtranslucent, polished and iridescent, to opaque porcellanous. Colour pattern external, usually in the form of radials associated with the ribbing, and showing through to the interior in subtranslucent shells but confined to the marginal border in those with a thick porcellanous internal layer.

The gill cordon is complete, and the radula relatively short and folded back upon itself at the nascent end. The radula formula is—

$$\begin{aligned} & 3 + 1 + 4 + 1 + 3 \text{ or} \\ & 3 + 1 + (2 + 1 + 2) + 1 + 3 \text{ or} \\ & 3 + 1 + 5 + 1 + 3 \end{aligned}$$

The variations of the above formulae occur in the central teeth, which may consist of 4 identical centrals in a horizontal row, as in *Patella vulgata*, or in others when an incipient median central is added, or, again, in certain species of the subgenus *Scutellastra* when the median central attains the size of the other centrals, thus making 5 identical centrals. The lateral is almost invariably pluricuspid, and the 3 marginals are narrow, with very weak cusps at most, and they are apparently functionless.

The range of the genus is wide-spread in warm and temperate seas, but is absent from certain regions, notably both coasts of North America, the Caribbean and South America.

A number of fossil species attributed to *Patella* has been described, ranging from the upper Cretaceous onward, but most of these are difficult to assign generically or even to family since we lack knowledge of the soft parts.

The genus *Patella* is here divided into several subgenera that are each more or less restricted to definite geographical areas. Their synonymy is recorded under the relevant subgenera.

Subgenus *Patella* Linnaeus, 1758

Type: *Patella vulgata* Linnaeus, 1758

Shell of small to moderate size, the inner layer subtranslucent and more or less iridescent, often with the external colour pattern showing through the glaze. Gill cordon complete and radula with 4 identical central teeth, arranged in a horizontal row, and occasionally with an incipient median central, represented by a narrow functionless plate.

Distribution, the western coastline of Europe, from the Lofoten Islands, and including Britain, to the Mediterranean, down to Madeira and the Canary Islands, and appearing again along the coast of Natal.

Synonymy—

- 1758 *Patella* Linnaeus, Syst. Nat., ed. 10, p. 780. Type, by subsequent designation, Fleming, 1815: *Patella vulgata* Linnaeus, 1758.
 1810 *Patellus* Montfort, Conchyliologie Systématique, vol. 2, p. 67. Type, by original designation: *Patellus roseus* Montfort, 1810.
 1884 *Patellopsis* Thiele in Troschel, Das Gebiss der Schnecken, vol. 2, p. 324, based upon the radula (pl. 28, fig. 22) of an unnamed South African *Patella*, possibly *variabilis* Krauss, 1848.
 1884 *Patellastra* Monterosato, Natural. Sicil., vol. 3, p. 103. Type, by monotypy: *Patella lusitanica* Gmelin, 1791.
 1912 *Costatopatella* Pallary, Mem. Inst. Egypte, vol. 7 (3), p. 148.
 1920 *Granopatella* Pallary, Arch. Sci. Prot. Franc. Expl. Sci. Maroc, fasc. 2, p. 72.
 1920 *Lacvipatella* Pallary, Arch. Sci. Prot. Franc. Expl. Sci. Maroc, fasc. 2, p. 72.

Patella vulgata Linnaeus, 1758

(Pl. 63, figs. 1-3; pl. 68, figs. 1, 2; pl. 61, fig. 1)

Range—Western Europe, Lofoten Islands to Spain and the British Isles.

Remarks—This is the common European edible limpet. It is moderately large, solid, oval and conical, radially ribbed, and usually whitish or yellowish, often radially lined or streaked in brown.

Description—Shell moderately large, up to 60 mm. (2½ inches) in length, solid, oval, conical, with the apex a little in front of the middle, and sculptured with radiating ribs and interstitial lirae. Colour varying from whitish to yellowish, sometimes radially lined or streaked with dark-brown. Interior weakly iridescent, the spatula grayish to leaden colour or clouded with whitish

callus, often with the shell margin dark-lined by the external pattern showing through.

Radula—Formula 3 + 1 + 4 + 1 + 3. The four central teeth are of approximately equal size, and are arranged in a straight horizontal line, without a median vestigial central.

Measurements (mm.)—

length	width	height	
60.5	53.0	32.0	Caldy Island, S. Wales
43.0	37.5	21.0	Isle of Man

Synonymy—

- 1758 *Patella vulgata* Linnaeus, Syst. Nat., ed. 10, p. 782.
 1798 *Patella conus* Röding, Mus. Bolten., pt. 2, p. 8.
 1811 *Patella radata* Perry, Conch., London, pl. 43, fig. 1 (non Born, 1778).
 1839 *Patella conica* Anton, Verzeichniss, p. 26 (non Blainville, 1825).
 1844 *Patella vulgata* var. *conica* Brown, Illust. Conch., ed. 2, p. 65.
 1844 *Patella vulgata* var. *communis* Brown, Illust. Conch., ed. 2, p. 63.
 1854 *Patella vulgata* Linn., Reeve, Conch. Iconica, vol. 8, pl. 18, figs. 42 a-c. (Dec.).
 1857 *Patella vulgata* var. *intermedia* Knapp (in Murray), Ann. Mag. Nat. Hist., 19, p. 211.
 1865 *Patella vulgata* var. *elevata* Jeffreys, Brit. Conch., vol. 3, p. 237.
 1865 *Patella vulgata* var. *pieta* Jeffreys, Brit. Conch., vol. 3, p. 237.
 1887 *Patella vulgata* var. *secermenda* Dautzenberg, Excursion. St.-Lumaire, p. 13.
 1891 *Patella vulgata* Linn., Pilsbry, Man. Conch., vol. 13, p. 82, pl. 10, figs. 1-6.
 1906 *Patella vulgata* var. *aurea* Martel in Dautzenberg & Durouchoux, Suppl. Faun. malac. St.-Malo, p. 11.
 1906 *Patella vulgata* var. *major* Dautzenberg & Durouchoux, Suppl. Faun. malac. St.-Malo, p. 11.

Patella ferruginea Gmelin, 1791

(Pl. 69, figs. 1-3)

Range—Mediterranean, from the Aegean to Spain and North Africa.

Remarks—This species is easily recognised by its thick shell, strong radial ribs, deeply corrugated margin and ashen colour.

Description—Shell moderately large, up to 62 mm. (2-7/16 inches) in length, very solid, ovate, conical, with the apex subcentral, coarsely sculptured with numerous strong radial ribs, that are rendered scabrous by concentric growth lines, and also strongly corrugate the margin. Colour, externally dull ashen, more or less stained with pale brown; internally, bluish white, corrugated margin bordered in dark-brown, almost black, and the spatula clouded with whitish callus.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. Radula very similar to that of *caerulea*, except that the

small slender median central is a definite tooth bearing a small cusp.

Measurements (mm.)—

length	width	height	
60.0	51.5	24.0	Corsica
59.0	47.0	21.0	Corsica

Synonymy—

- 1791 *Patella ferruginea* Gmelin, Syst. Nat., ed. 13, p. 3706; based upon Martini-Chemnitz, Conch. Cab., vol. 1, pl. 8, fig. 66.
 1819 *Patella luteola* Lamarck, Anim. sans vert., vol. 6 (1), p. 327.
 1819 *Patella pyramidata* Lamarck, Anim. sans vert., vol. 6 (1), p. 327.
 1826 *Patella rouxii* Payraudeau, Cat. Moll. Corse, p. 90.
 1826 *Patella lamarkii* Payraudeau, Cat. Moll. Corse, p. 90.
 1854 *Patella costoso-plicata* Reeve, Conch. Iconica, vol. 8, pl. 8, figs. 14 a, b.
 1854 *Patella ferruginea* var. *ficarazzensis* de Gregorio, Bull. Soc. Mal. Ital., vol. 10, pp. 120-124.
 1854 *Patella ferruginea* var. *imperatoria* de Gregorio, Bull. Soc. Mal. Ital., vol. 10, pp. 120-124.
 1854 *Patella ferruginea* var. *percostata* de Gregorio, Bull. Soc. Mal. Ital., vol. 10, pp. 120-124.
 1854 *Patella ferruginea* var. *sitta* de Gregorio, Bull. Soc. Mal. Ital., vol. 10, pp. 120-124.
 1891 *Patella ferruginea* Gmelin, Pilsbry, Man. Conch., vol. 13, p. 81, pl. 53, figs. 1-3; pl. 17, figs. 23, 24.
 1950 *Patella luteola* Lamarck, Mermod. Rev. Suisse Zool., vol. 57, no. 34, p. 692, fig. 3 (type).
 1968 *Patella ferruginea* Gmelin, Nordsieck, Eur. Meeres-Gehaueschm. Stuttgart, p. 15.

*Records—*CORSICA; near Bonifacio (AWBP. coll. 28388). SPANISH MOROCCO; Melilla (AWBP. coll.); Chafarinas Islands (Zafarines), 35° 10' N., 2° 25' E. (AWBP. coll.).

*Types—*The type of *luteola* is in the Museum d'Histoire Naturelle de Geneve.

***Patella baudonii* Drouet, 1858**

(Pl. 75, figs. 1, 2)

*Range—*Azores, Santa Maria and Pico.

*Remarks—*This species, which the writer has not seen, seems to be closely allied to, if not identical with, *Patella ferruginea* Gmelin, 1791. Pilsbry's translation of the original description follows, and the illustrations are from Drouet's original figures.

Description—"Shell large, subelevated, coarsely ribbed, plicate, solid, thick; outside greyish-green, inside white; vertex subacuate, submedian; aperture oval, a little crenated."

Measurements (mm.)—

length	width	height	
60.0	50.0	25.0	(Drouet)

Synonymy—

- 1858 *Patella baudonii* Drouet, Moll. Mar. Açores, p. 41, pl. 2, figs. 8, 9.
 1891 *Patella baudonii*: Pilsbry, Man. Conch., vol. 13, p. 86, pl. 54, figs. 15, 16.

***Patella rustica* Linnaeus, 1758**

(Pl. 69, figs. 4, 5)

*Range—*Atlantic coast of south west France, Portugal, Spain, Mediterranean and Adriatic Seas.

*Remarks—*This species, better known by the Gmelin name, *lusitanica*, is rather small, ovate-conical, and densely sculptured with fine granular radials. The external colour is greyish, or pale brownish, speckled with black, and internally it is broadly radially banded in dark purplish-brown. A nearly related species is the narrowly-ovate *pipercata* from Madeira and the Cape Verde Islands.

*Description—*Shell rather small, up to 35 mm. (1½ inches) in length, solid, ovate, tall-conical, with the apex slightly anterior to the middle. Sculpture consisting of very numerous, closely spaced, narrow, somewhat uneven, granulose radial riblets. Colour, externally pale yellowish-brown to greyish, often with the rib-granules black, internally broadly rayed in dark-brown or blue-black on a greyish-silvery ground. Spatula white callused, often surrounded by a yellowish-brown stain.

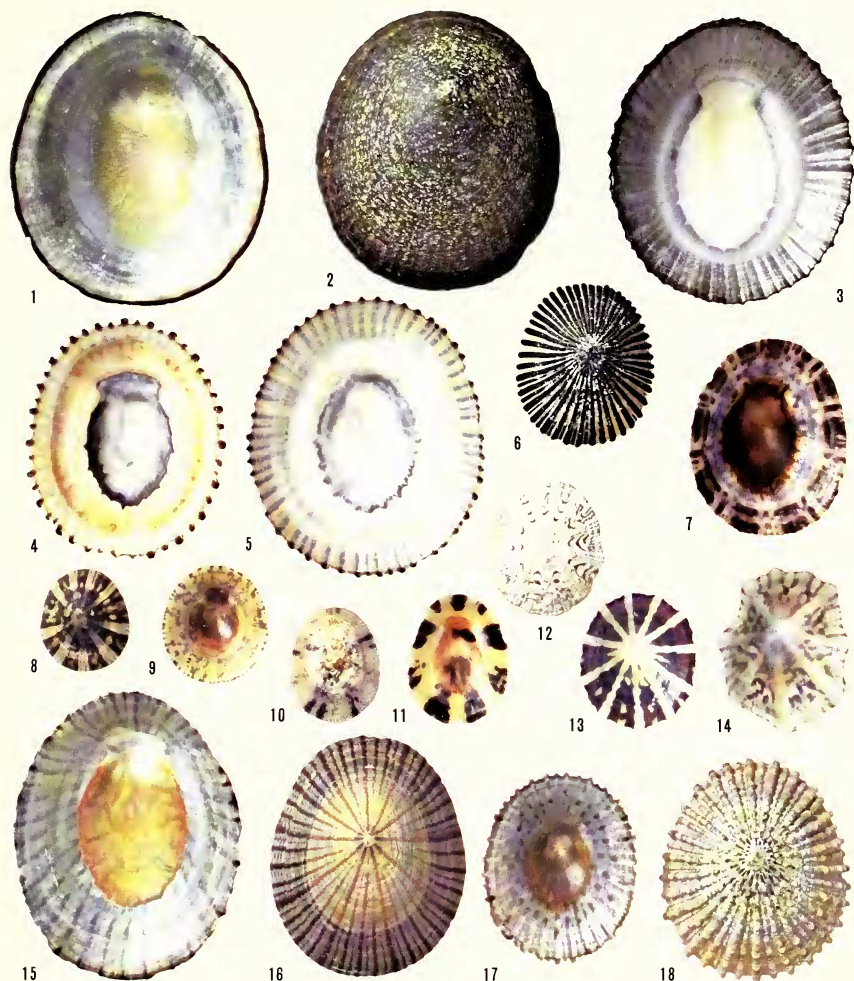
*Radula—*Formula 3 + 1 + (2+1+2) + 1 + 3. Radula with or without a narrow median central tooth, remaining four centrals of uniform size, and arranged in a horizontal line.

Measurements (mm.)—

length	width	height	
35.0	28.5	17.0	Melilla, Morocco
28.0	24.0	12.5	Melilla, Morocco

Synonymy—

- 1758 *Patella rustica* Linnaeus, Syst. Nat., ed. 10, p. 783.
 1791 *Patella lusitanica* Gmelin, Syst. Nat., ed. 13, p. 3715.
 1798 *Patella squamata* Röding, Mus. Bolten, pt. 2, p. 10.
 1819 *Patella punctata* Lamarck, Anim. sans vert., vol. 6, p. 333.
 1825 *Patella subgranularis* Blainville, Dict. Sci. Nat., vol. 38, p. 113. (fide Christiaens, 1968, p. 367).
 1854 *Patella nigro-punctata* Reeve, Conch. Iconica, vol. 8, pl. 23, figs. 57 a-c (Dec.).
 1853 *Patella lusitanica* var. *minor* Marion, Faune bass. med., p. 48.
 1884 *Patellastra lusitanica* Gmel., Monterosato, Natural. Sicil., vol. 3, p. 103.
 1891 *Patellastra lusitanica* Gmel., Thiele, in Troschel & Thiele, Das Gebiss der Schnecken, 2, pl. 28, fig. 12 (radula).
 1891 *Patella lusitanica* Gmel., Pilsbry, Man. Conch., vol. 13, p. 87, pl. 11, figs. 15-19.
 1912 *Patella rustica* Linné var. *major* Pallary, Explor. scient. Maroc., p. 72.

Plate 67. Indo-Pacific *Cellana*

Figs. 1, 2. *Cellana testudinaria* (Linnaeus, 1758). Vannalava, Banks Islands.
 Fig. 3. *Cellana talcosa* (Gould, 1846). Molokai, Hawaiian Islands.
 Figs. 4-6. *Cellana exarata* (Reeve, 1854). Molokai, Hawaiian Islands.
 Fig. 7. *Cellana grata* (Gould, 1859). Matsushima Island, Korea.
 Figs. 8, 9. *Cellana radiata* (Born, 1778). Colombo, Ceylon.
 Figs. 10, 11. *Cellana radiata* subspecies *capensis* (Gmelin, 1791). Near Durban, Natal.

Figs. 12, 13. *Cellana radiata* subspecies *orientalis* (Pilsbry, 1891). Fig. 12. Russell Islands, Solomon Islands (note the strong radial folds). Fig. 13. Tau Island, Samoa.
 Fig. 14. *Cellana radiata* subspecies *cnucagona* (Reeve, 1854). Jolo, Philippine Islands.
 Figs. 15, 16. *Cellana nigrolucata* (Reeve, 1854). Fig. 15. Fukura, Awaji, Japan. Fig. 16. Chringashima, Japan.
 Figs. 17, 18. *Cellana mazatlanica* (Sowerby, 1839). Bonin Islands.

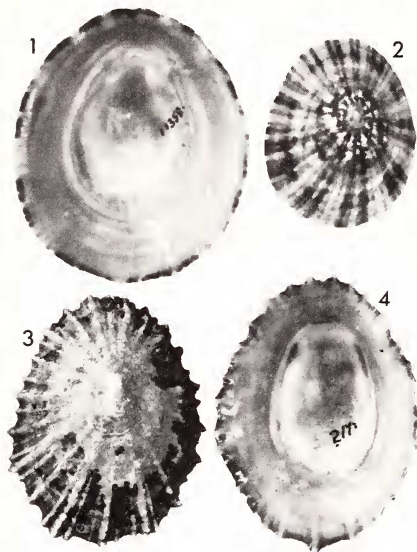


Plate 68. Figs. 1, 2. *Patella vulgata* Linnaeus, 1758. Fig. 1. Kimmeridge, England, 52 mm., AWBP coll. 11358. Fig. 2. Isle of Man, 38 mm., AWBP coll. 11359. Figs. 3, 4. *Patella aspera* Röding, 1798, Caldy Island, Wales, 47 mm., AWBP coll. 217.

- 1912 *Patella rustica* Linné var. *maroccana* Pallary, Explor. scient. Maroc, p. 72.
 1938 *Patella lusitana* var. *orientalis* Pallary, Jour. Conchyl., vol. 82, p. 47.
 1950 *Patella punctata* Lam., Mermod. Rev. Suisse Zool., vol. 57 (34), p. 695, fig. 7 (type).
 1968 *Patella lusitana* Gmelin, Christiaens, Bull. Mus. Nat. d'Hist. Nat., ser. 2, vol. 40 (2), pp. 366, 367.
 1968 *Patella (Patellastra) rustica* L., Nordsieck, Die europ. Meeres Gehäuseschnecken, Stuttgart, p. 15.

Patella piperata Gould, 1846

(Pl. 71)

Range—Madeira and Cape Verde Islands.

Remarks—Shell very similar to that of *rustica* in sculpture and in coloration, but more elongate-ovate in its younger stages, and with the apex nearer to the anterior end.

Radula—The radula differs from that of *rustica* in that the four central teeth are not in horizontal alignment, the middle pair being set lower than the outer pair (Christiaens, 1968, p. 370, fig. 2a).

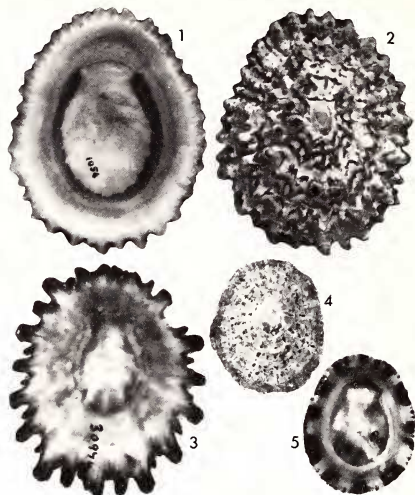


Plate 69. Figs. 1-3. *Patella ferruginea* Gmelin, 1791. Fig. 1. Chafarimes Islands, Morocco, 55 mm., AWBP coll. 1054. Fig. 2. Bonifacio, Corsica, 60 mm., AWBP coll. 28388. Fig. 3. Melilla, Morocco, 42 mm., AWBP coll. 30974. Figs. 4, 5. *Patella rustica* Linnaeus, 1758, Oran, Algeria, 25-26 mm., AWBP coll. 80.

Measurements (mm.)—

length	width	height	
44.0	40.0	—	Christiaens, 1968, p. 372
27.0	21.0	12.0	Madeira

Synonymy—

- 1839 *Patella guttata* Orbigny, in Webb & Berthelot, Hist. Nat. Moll. Canaries, p. 98 (non Gmelin, 1791).
 1846 *Patella piperata* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 150.
 1846 *Patella nigrosquamosa* Dunker, Zeitschr. f. Malak., p. 25.
 1866 *Patella frauenfeldi* Dunker, Verh. k. k. zool.-bot. Ges. Wien, vol. 16, p. 914. "Madras" in error for Madeira.
 1867 *Patella frauenfeldi* Dunker, Frauenfeld, Reise Novara, Zool., vol. 2, pt. 3, Moll., p. 15, pl. 2, figs. 26 a, b.
 1968 *Patella piperata watsoni* Christiaens, Bull. Mus. Nat. d'Hist. Nat. ser. 2, vol. 40, no. 2, p. 371, text fig. 2 b; pl. 1, fig. b.
 1968 *Patella piperata nigro-radiata* Christiaens, Bull. Mus. Nat. d'Hist. Nat. ser. 2, vol. 40, no. 2, p. 371, text fig. 2 c; pl. 1, fig. c.
 1968 *Patella piperata alba* Christiaens, Bull. Mus. Nat. d'Hist. Nat. ser. 2, vol. 40, no. 2, p. 371, pl. 1, fig. g (non *P. alba* Anton, 1839).

Patella caerulea Linnaeus, 1758

(Pls. 61, 63, 72, 74)

Range—Mediterranean and Adriatic Seas, Portugal, Azores, Madeira and Canary Islands.

Remarks—This species is variable in shape, colour, and strength of the radial ribbing, but in general terms it is a depressed, thin, and spreading shell, with 6 or 7 distinct marginal angles, resultant from 7 to 9 prominent radial folds. The typical form of the species from the Mediterranean and Adriatic Seas, has a colour range, varying from almost white to buff or pale brownish, often radially banded with iridescent blue.

Shells from the Azores and Madeira are larger, even more depressed than the typical species, have broader and more prominent radial folds, and are of much darker colour, being dark reddish brown externally, similarly coloured internally, but diffused with iridescent blue, and with a distinct-edged, white spatula. This latter form is *crenata* Gmelin, and when more material is studied, Gmelin's name may prove to be usable to define a regional subspecies of *caerulea*, restricted to the Azores, Madeira and Canary Islands. Negating this possibility is the fact that shells from the adjacent mainland of Spanish Morocco have the dark colouring of *crenata* but a shape and sculpture similar to those in typical *caerulea*.

Description—Shell of moderately large size, 40-71 mm. (1½-2¾ inches) in length, thin, depressed, usually distinctly 6 or 7 angled, resultant from 7 to 9 broadly rounded primary folds that project at the margin. Surface crowded with secondary radials of varying sizes, mostly imbricated by concentric growth lines. Colour whitish or buff externally, the interior silvery-white, radially lined or banded in blue, the spatula bluish or white-callused. Some examples have a pale yellowish interior without radial markings, and the form *crenata* is dark reddish brown, internally diffused with iridescent blue, and with a clear-cut white spatula.

Radula—Formula 3 + 1 + (2+X+2) + 1 + 3. The radula is of the same style as that of *vulgata*, except for a slight median gap between the pairs of four centrals, in which appears a narrow vestigial plate. The four functional centrals, as in *vulgata*, are in a straight horizontal row.

Measurements (mm.)—(all A. W. B. Powell collection.)

length	width	height	
51.0	46.0	12.0	Capri, Italy
36.0	30.0	10.5	Melilla, Morocco
71.0	64.0	14.0	Madeira (<i>crenata</i> form)

Synonymy—

- 1758 *Patella caerulea* Linnaeus, Syst. Nat., ed. 10, p. 782.
 1791 *Patella crenata* Gmelin, Syst. Nat., ed. 13, p. 3706.
 1791 *Patella margaritacea* Gmelin, Syst. Nat., ed. 13, p. 3707.
 1793 *Patella tarantina* von Salis, Reise ins Koenig. Neapel, p. 359, pl. 6, fig. 2.
 1798 *Patella silicina* R6ding, Mus. Bolten., pt. 2, p. 9.
 1819 *Patella tarantina* Lamarck, Anim. sans vert., vol. 6, p. 332.
 1826 *Patella bonnardii* Payraudeau, Moll. de Corse, p. 89.
 1836 *Patella fragilis* Philippi, Enum. Moll. Sicil., vol. 1, p. 110.
 1838 *Patella subplana* Potiez & Michaud, Gal. Moll. Douai, vol. 1, p. 524.
 1854 *Patella scutellaris* Lam., Reeve, Conch. Iconica, vol. 8, pl. 20, fig. 49.
 1882 *Patella stollata* Bucquoy, Dautzenberg & Dollfus, Moll. mar. Roussillon. (non Helbling, 1779).
 1882 *Patella adspersa* Bucquoy, Dautzenberg & Dollfus, Moll. mar. Roussillon.
 1882 *Patella caerulea* var. *cognata* Bucquoy, Dautzenberg & Dollfus, Moll. mar. Roussillon, p. 471.
 1882 *Patella caerulea* var. *intermedia* Bucquoy, Dautzenberg & Dollfus, Moll. mar. Roussillon, p. 471.
 1891 *Patella caerulea* Linne', Pilsbry, Man. Conch., vol. 13, p. 83, pl. 10, figs. 7-12.
 1950 *Patella tarantina* Lam., Mermiod, Rev. Suisse Zool., vol. 57 (34), p. 685 (text figs. of type series).

Records—ITALY: Naples; Isle of Capri; Palermo, Sicily. MALTA. MOROCCO: Melilla. MADEIRA (*crenata* form). (All AWBP coll.)

Patella moreleti Drouet, 1858

(Pl. 75, figs. 3, 4)

Range—Fayal, Azores.

Remarks—The writer has not seen this species which possibly may be only a form of *Patella caerulea* Linnaeus. Pilsbry's translation of the original description follows, accompanied by copies of Drouet's figures.

Description—"Shell subdepressed, very rugose-ribbed, the ribs scaly, scarcely solid; brownish-green outside; inside brownish or reddish, iridescent, with a white spot at the summit. Apex acute. Aperture ovate, crenulated."

Measurements (mm.)—

length	width	height	
40.0	30.0	12.0	(Drouet)

Synonymy—

- 1858 *Patella moreleti* Drouet, Moll. Mar. Azores, p. 42, pl. 2, figs. 10, 11.
 1891 *Patella moreleti* Drouet, Pilsbry, Man. Conch., vol. 13, p. 85, pl. 56, figs. 27, 28.

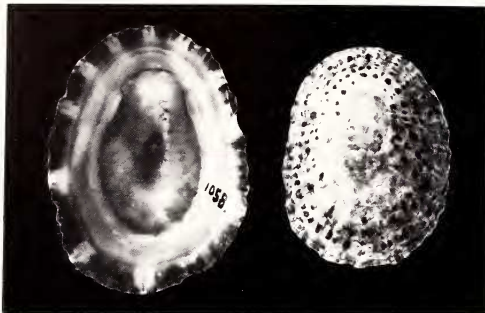


Plate 71. *Patella piperata* Gould, 1846. Madeira, 27 mm., AWBP coll. 1058.

Patella lowei Orbigny, 1839

(Pl. 74, figs. 1, 2)

Range—Canary Islands.

Remarks—This species appears to be closely allied to the Mediterranean *caerulea*, from which it differs mainly in having stronger, and more regular sculpture, resulting in a more even denticulation of the margin, as opposed to the 6 or 7 distinct marginal angles of *caerulea*. Also, the coloration in *lowei* is darker, the exterior being rusty-brown, and the interior dark bluish to reddish brown at the edges, reflecting iridescent blue, and always with a clearcut white spatula.

Description—Shell of moderate size, up to 56.5 mm. (2¼ inches) in length, ovate, depressed, with the apex towards the anterior third, solid but not very thick, densely sculptured with broadly rounded primary radials and narrow intermediates. The margin is strongly and regularly corrugated, the projections compound and foliated. Colour as described above.

Measurements (mm.)—(both A. W. B. Powell collection).

length	width	height	
56.5	48.0	13.0	Teneriffe
54.5	44.5	11.0	Teneriffe

Synonymy—

- 1839 *Patella lowei* Orbigny, in Webb and Berthelot. Hist. Nat. Canaries, Moll., vol. 2, p. 97, pl. 7, figs. 9, 10.
 1839 *Patella azorica* Nuttall, in Jay, Cat. Shells, ed. 3, p. 38.
 1891 *Patella caerulea* var. *lowei* Orbigny, Pilsbry, Man. Conch., vol. 13, p. 84, pl. 29, figs. 44-46; pl. 53, figs. 7-11.

Records—CANARY ISLANDS (Orbigny); Teneriffe (AWBP coll. 5268).

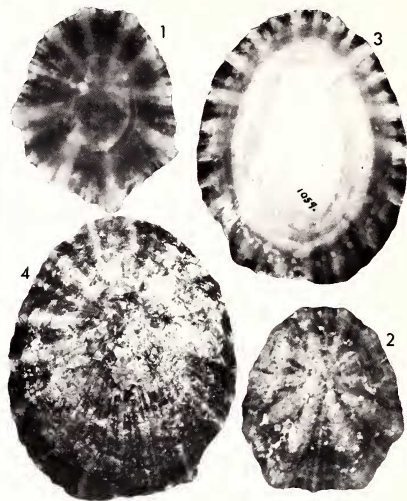


Plate 72. Figs. 1, 2. *Patella caerulea* Linnæus, 1758. Isle of Capri, Italy, 51 mm., AWBP coll. 211. Figs. 3, 4. *Patella safiana* Lamarek, 1819. Oran, Algeria, 65 mm., AWBP coll. 1959.

Patella gomesii Drouet, 1858

(Pl. 74, figs. 5, 6)

Range—Azores, Bay of San Lourenzo, Santa Maria and Pico.

Remarks—The writer has not seen examples of this shell, which may prove to be a form of *lowei*. Its distinctive character is in having about 14 very prominent rounded radial folds, the whole surface, folds included, being densely radially lirate.

Description—(Pilsbry's translation of original): "Shell large, subdepressed, rugose, ribbed-plicate, rather solid; outside grayish-brown or rufescent; inside shining, brown, pearly; apex situated at the front third of the length, obtuse; aperture oval, entire."

Measurements (mm.)—

length	width	height
50-60	50-53	12-15

Synonymy—

- 1858 *Patella gomesii* Drouet, Moll. Mar. Illes Açores, p. 39, pl. 1, figs. 6, 7.
 1891 *Patella gomesii* Drouet, Pilsbry, Man. Conch., vol. 13, p. 86, pl. 54, figs. 17, 18.

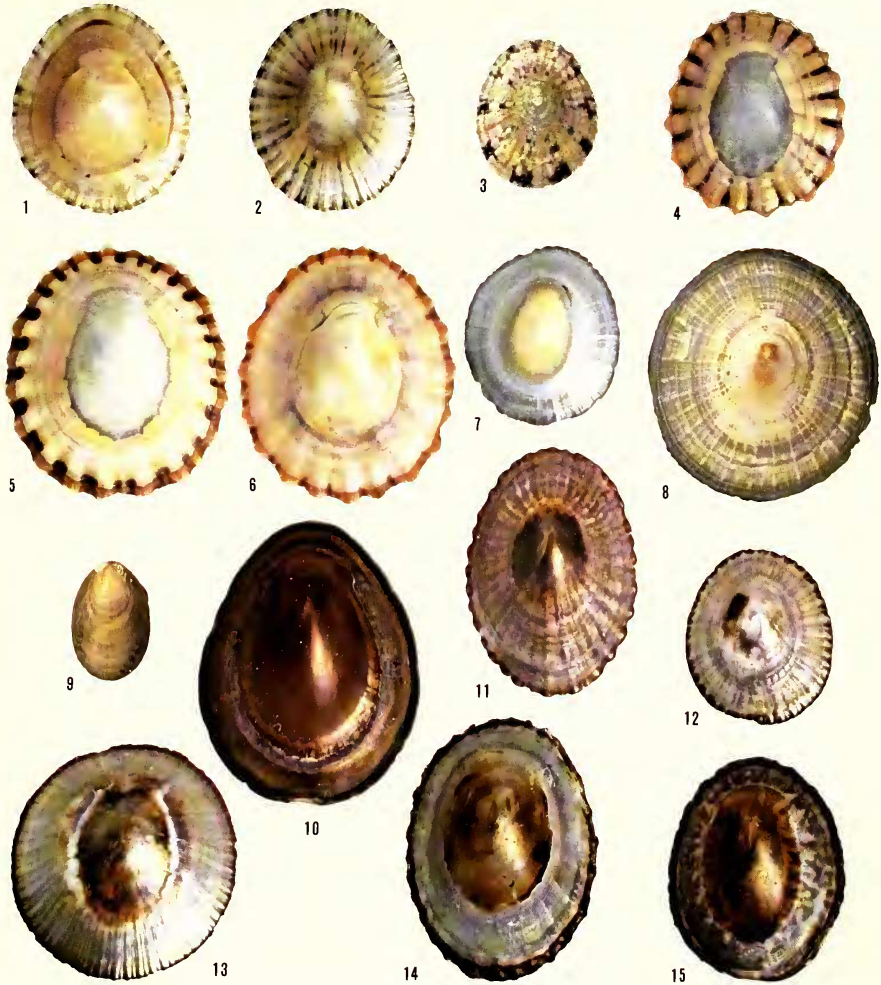


Plate 73. Antarctic Australian *Cellana* and
Subantarctic *Nacella*

(for plate 70, see p. 105)

Figs 1-3. *Cellana tramoserica* (Holten, 1802). Fig. 1. South Australia. Fig. 2. Caloundra, Queensland. Fig. 3. Torquay, Victoria.

Figs. 4-6. *Cellana solida* (Blainville, 1825). Figs. 4, 5. Stanley, Tasmania. Fig. 6. South Australia (*rubraurantiaca* form).

Figs. 7, 8. *Cellana ardotiaca* (Hombron & Jacquinot, 1841). Island of Juan Fernandez.

Fig. 9. *Nacella mytilina* (Helbling, 1779). Falkland Islands.

Fig. 10. *Nacella kerguelensis* (E. A. Smith, 1877). Heard Island.

Fig. 11. *Nacella (Patimigera) deanrata* (Gmelin, 1791). Falkland Islands.

Fig. 12. *Nacella (Patimigera) terroris* (Filhol, 1880). Campbell Island.

Fig. 13. *Nacella (Patimigera) chypceator* (Lesson, 1831). Chile.

Figs. 14, 15. *Nacella (Patimigera) magellanica* (Gmelin, 1791). Possession Bay, Patagonia.

[These occasional blank areas occur between genera and subgenera to permit the insertion of new material and future sections in their proper systematic sequence.]

Subgenus Uncertain

The following six species of *Patella* are insufficiently understood, particularly with regards to their soft anatomy, to be assigned as yet to their proper subgenera.

Patella candei Orbigny, 1839

(Pl. 75, figs. 7, 8)

Range—Canary Islands.

Remarks—The writer has not seen this species, but from published information it appears to be closely allied to *citrullus* from Funchal, Madeira. The surface has subsobsolete radials crossed by prominent wavy concentric lirations that haphazardly anastomose to form an irregular netted appearance.

Description—(Pilsbry's 1891 translation of the original description): "Shell elevated, conical, thick, smooth or irregularly roughened; ovate, margin entire. Inside buff, bluish in the middle, outside pale yellow."

Measurements (mm.)—

length	width	height
67.0	58.0	27.0

Synonymy—

- 1839 *Patella candei* Orbigny, in Webb and Berthelot, Hist. Nat. Canaries, vol. 2, Moll., p. 98, pl. 7, figs. 11, 12.
 1854 *Patella candei* Orbigny, Reeve, Conch. Iconica, vol. 8, pl. 15, figs. 34 a, b.
 1891 *Patella candei* Orbigny, Pilsbry, Man. Conch., vol. 13, p. 86, pl. 55, figs. 22-24.

Patella citrullus Gould, 1846

(Pl. 75, figs. 9, 10)

Range—Funchal, Madeira.

Remarks—The writer has not seen examples of this species which appears to be related to *candeii*. Pilsbry (1891, l.c.) remarked that the external surface resembles the skin of a cucumber.

Description—(original) "Shell sub-diaphanous, thin sub-conical, moderately elevated, summit prominent; apex anterior, acute, feebly incurved, usually somewhat eroded; a great number of faintly

elevated lines, studded with fine tubercles or asperities, radiate from it, and become obsolete about half way towards the margin. Striae of increment coarse and irregular, overlaying each other, so as to give the shell a rude, concentrically squamose aspect externally; disc nearly oval, a little narrowed anteriorly; margin very thin and sharp, finely and irregularly undulated. External colour a dusky olive-green, with a shade of brown showing through it, ornamented with concentric, undulating lines of obscure white. Interior greenish-white, with bright iridescent reflections; a slight spatulaform deposit at the fundus, bluish at the edges and forepart, passing into greenish towards the middle and posterior portions."

Measurements (mm.)—

length	width	height
45.0	32.0	7.0

Synonymy—

- 1846 *Patella citrullus* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 149.
 1891 *Patella citrullus*; Gould, Pilsbry, Man. Conch., vol. 13, p. 86, pl. 28, figs. 39-41.
 1964 *Patella citrullus* Gould, Johnson, U. S. Nat. Mus. Bull. 239, p. 56.

Patella concolor Krauss, 1848

(Pl. 64, 76, 78)

Range—Natal coast to as far south and west as Bushman's River, near Port Elizabeth.

Remarks—The former name of this well-known South African limpet, *Patella variabilis* Krauss, 1848, is invalidated by two prior homonyms, those of Roding, 1798, and Risso, 1826. The earliest valid name to replace *variabilis* is *concolor* which is the uniformly dark-ashen colour form of this species. The species is exceedingly variable in colour pattern, but the shape, which is ovate, distinctly narrowed in front, remains constant. Also it is of light build and is often semi-transparent.

Description—Shell rather small, usually between 30 and 35 mm. in length, but occasionally attaining 50 mm. (2 inches) in length, of light build, sometimes semi-transparent, rather depressed, ovate, but distinctly narrowed at the anterior end. Sculptured with about 80 fine but somewhat unequal radial ribs, crossed by dense inconspicuous concentric lirae. Apex subcentral to about the anterior third, the area in its vicinity usually smooth. Colour extremely variable, ranging from plain yellow, pale yellowish brown, and rusty-brown (*concolor*) to almost black, and variously maculated; sometimes the

yellow form has one, or several, dark-brown radial streaks, and the black form (*polygramma*) has the primary radials picked out in white; the common form is pale yellowish brown, radially lined and speckled in dark-brown; spatula ill-defined, light brownish or clouded with white callus.

Radula—Formula $3 + 1 + (2+0+2) + 1 + 3$. The radula differs from those of all other South African patellids in the absence of the middle member of the central teeth; the four remaining centrals, however, are grouped in pairs with a space between them, whereas in the radula of *Patella vulgata* and other European patellids, the four centrals are closely grouped, without space for a middle member.

Measurements (mm.)—

length	width	height	
50.0	45.0	11.25	South Africa
48.5	41.25	14.00	Natal coast
35.0	30.5	9.00	Port Alfred
28.5	24.0	7.00	Coffee Bay

Synonymy—

- 1848 *Patella variabilis* Krauss, Sudaf. Moll., Stuttgart, p. 55, pl. 3, fig. 12 (non *P. variabilis* Risso, 1826).
 1848 *Patella variabilis* var. *fasciata* Krauss, Sudaf. Moll., Stuttgart, p. 55, pl. 3, fig. 12 a (non *P. fasciata* Gmelin, 1791).
 1848 *Patella variabilis* var. *radiata* Krauss, Sudaf. Moll., Stuttgart, p. 55, pl. 3, fig. 12 b. (non *P. radiata* Born, 1778).
 1848 *Patella variabilis* var. *concolor* Krauss, Sudaf. Moll., Stuttgart, p. 55, pl. 3, fig. 12 c.
 1891 *Heleioniscus variabilis* Krauss, Pilsbry, Man. Conch., vol. 13, p. 147, pl. 16, figs. 18-20.

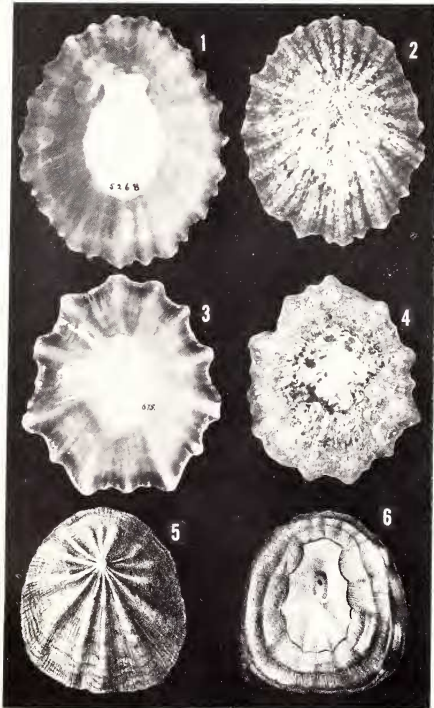


Plate 74. Figs. 1, 2. *Patella lowei* d'Orbigny, 1839, Tenerife, Canary Islands, 56.5 mm., AWBP coll. 5268. Figs. 3, 4. *Patella* cf. *caerulea* Linnaeus, 1758 (*crenata* form), Madeira, 70 mm., AWBP coll. 675. Figs. 5, 6. *Patella gomesii* Drouet, 1858, Azores, 50-60 mm. From Pilsbry, 1891, pl. 54, figs. 17, 18.

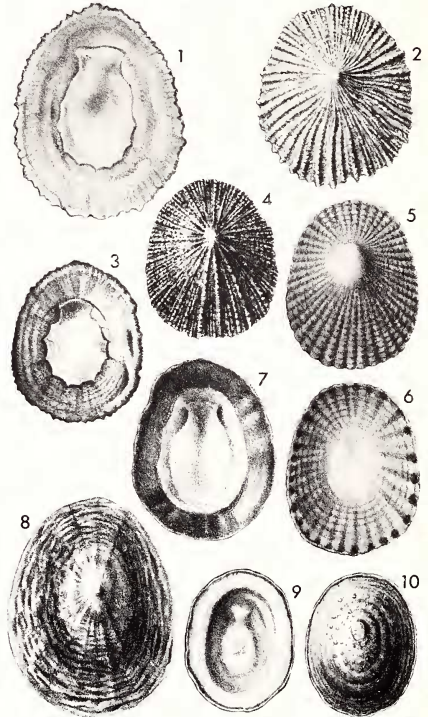
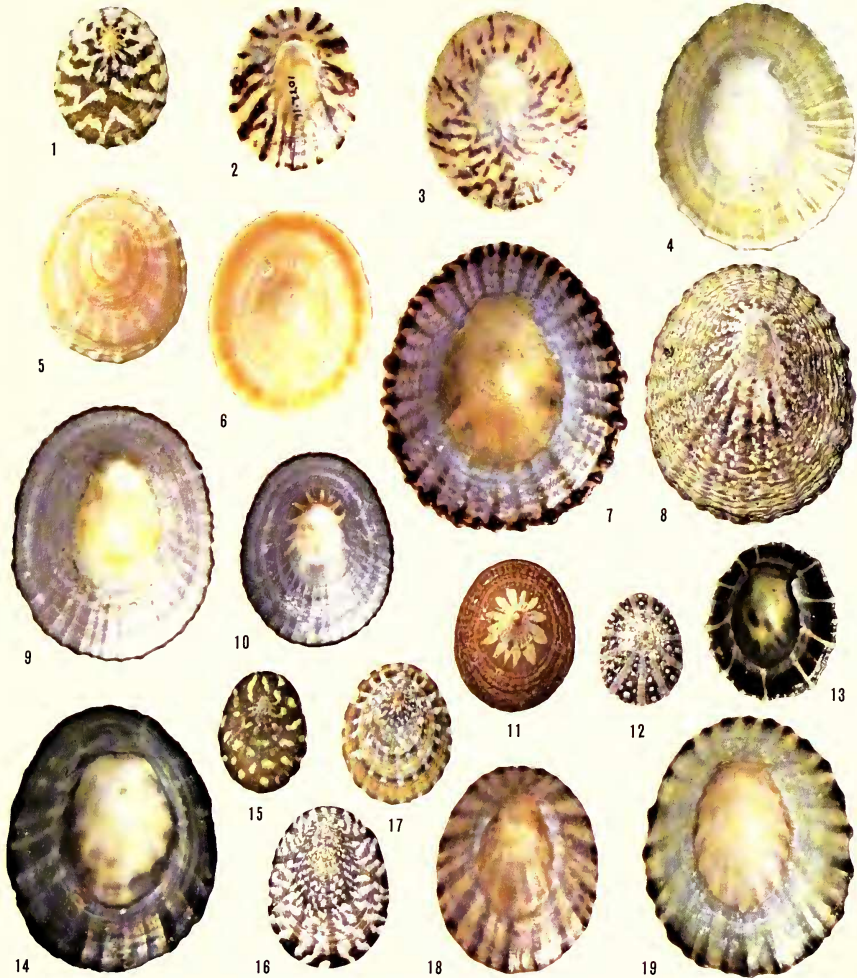


Plate 75. Figs. 1, 2. *Patella baudonii* Drouet, 1858, Azores, 60 mm. Figs. 3, 4. *Patella moreleti* Drouet, 1858, Fayal, Azores, 40 mm. Figs. 5, 6. *Patella rangiana* Rochebrune, 1882, Cape Verde Islands, 44 mm. Figs. 7, 8. *Patella candei* d'Orbigny, 1839, Canary Islands, 67 mm. Figs. 9, 10. *Patella citrullus* Gould, 1846, Funchal, Madeira, 45 mm. (All figures from Pilsbry, 1891, Manual of Conchology, vol. 13, plates 45, 54, 55, 56 and 58).

Plate 70. New Zealand *Cellana*

(for plate 73, see p. 101)

Figs. 1-4. *Cellana radians* (Gmelin, 1791). Fig. 1. Mount Maungamui, Bay of Plenty (*earlii* pattern). Figs. 2, 3. Motuili Island, Auckland. Fig. 4. Herekopare Island, Stewart Island (*perana* form).
 Figs. 5, 6. *Cellana flava* (Hutton, 1873). Fig. 5. East Cape. Fig. 6. Cape Campbell, Marlborough.
 Figs. 7, 8. *Cellana denticulata* (Martyn, 1784). Mount Maungamui, Bay of Plenty.
 Figs. 9-11. *Cellana stellifera* (Gmelin, 1791). Fig. 9. Whan-

garei Heads. Fig. 10. Ti Point, Hauraki Gulf. Fig. 11. Long Beach, Bay of Islands (bleached coloration of beach shells). Figs. 12, 13. *Cellana ornata* (Dillwyn, 1817). Fig. 12. Motutara, West Coast, Auckland. Fig. 13. Mount Maungamui. Figs. 14-16. *Cellana strigilis* (Hombroen & Jacquinot, 1841). Campbell Island.
 Figs. 17-19. *Cellana strigilis* subspecies *redimiculum* (Reeve, 1854). Kartigi Beach, North Otago, South Island, New Zealand.

- 1921 *Patella variabilis constellata* G. B. Sowerby, Proc. Malac. Soc., Lond., vol. 14, p. 127.
- 1931 *Patella variabilis* Krauss, Tomlin, Ann. Natal Mus., vol. 6 (3), p. 417.
- 1931 *Patella variabilis fasciolata* Tomlin, Ann. Natal Mus., vol. 6 (3), p. 418; nom. nov. pro *P. variabilis fasciata* Krauss, 1848 (non Gmelin, 1791).
- 1931 *Patella variabilis polygramma* Tomlin, Ann. Natal Mus., vol. 6 (3), p. 418; nom. nov. pro *P. variabilis radiata* Krauss, 1848 (non Born, 1778).
- 1932 *Patella variabilis* Krauss, Turton, Mar. Shells Port Alfred, p. 167, sp. 1187.
- 1932 *Patella variabilis fasciata* Krauss, Turton, Mar. Shells Port Alfred, p. 167, sp. 1188.
- 1932 *Patella variabilis radiata* Krauss, Turton, Mar. Shells Port Alfred, p. 167, sp. 1189.
- 1932 *Patella variabilis concolor* Krauss, Turton, Mar. Shells Port Alfred, p. 168, sp. 1190.
- 1932 *Patella variabilis constellata* Sby., Turton, Mar. Shells Port Alfred, p. 168, sp. 1191.
- 1932 *Patella variabilis helvola* Turton, Mar. Shells Port Alfred, p. 168, sp. 1192.
- 1932 *Patella ricensis* Turton, Mar. Shells Port Alfred, p. 167, pl. 38, fig. 1183.
- 1932 *Patella rota* (non Gmelin, 1791) Turton, Mar. Shells Port Alfred, p. 168, sp. 1193.
- 1932 *Patella helena* Turton, Mar. Shells Port Alfred, p. 168, pl. 39, fig. 1194.
- 1932 *Patella conspiciua* (non Philippi, 1849) Turton, Mar. Shells Port Alfred, p. 168, sp. 1196 (in part).
- 1932 *Patella farquhari* Turton, Mar. Shells Port Alfred, p. 170, pl. 40, fig. 1207.
- 1949 *Patella variabilis* Krauss, Koch, Ann. Natal Mus., vol. 11 (3), p. 510, pl. 23, figs. 1-11; text figs. 21, 22 (radula).

Records—SOUTH AFRICA: Natal coast to as far south and west as Port Elizabeth (Koch, 1949); Natal (ex Koch; AWBP coll.); Umtwalumi, 22 miles N. of Port Shepstone (V. Orr, 1955; ANSP); Port St. John's Pondoland (V. Orr; ANSP); Coffee Bay, Transkei (V. Orr, 1955; ANSP); Port Alfred (USNM; (AWBP coll.); near Durban (Mrs. N. Prior).

Patella depsta Reeve, 1855

(Pl. 77; pl. 78, fig. 1)

Range—Islands of St. Paul and Amsterdam, South Indian Ocean.

Remarks—Reeve cited "Macao and the Island of St. Paul" as localities for this species, but the first mentioned location is obviously a mistake. St. Paul is here nominated as the type locality. The species also occurs at the adjacent island of Amsterdam.

Gaillard (1954) figured the radula of *depsta*, and assigned the species to *Cellana*, but the radula suggests much closer alliance with the Patellinae, and except for the laterals, is not unlike that of *Patella* (*Patellona*). The laterals in the Patellinae are usually fused at the base, and have a pluricuspid head, but Gaillard's drawing shows a pair of laterals on either side, each separated at the base. Since the writer has no preserved material of this species the

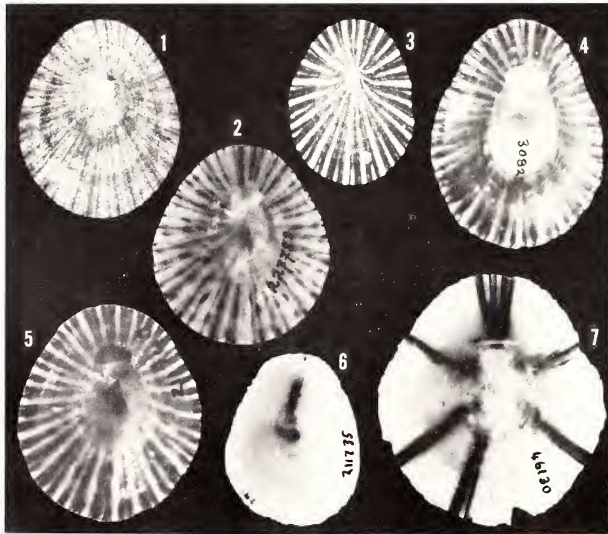


Plate 76. Figs. 1-7. *Patella concolor* Krauss, 1848. Figs. 1, 2. Port Alfred, South Africa, 35-36 mm., AWBP coll. 30872; 227788. Figs. 3, 4. Port St. John's, Pondoland, South Africa, 26-34 mm., AWBP coll. 30822. Fig. 5. Coffee Bay, Transkei,

South Africa, 30 mm., AWBP coll. 48225. Fig. 6. Umtwalumi, South Africa, 34 mm., AWBP coll. 211735. Fig. 7. South Africa, 50 mm., AWBP coll. 46130.



Plate 77. *Patella depsta* Reeve, 1854. Island of St. Paul, South Indian Ocean, 32.35 mm., AWBP coll. 46133.

apparently unusual form of the laterals cannot be confirmed at present.

Description—Shell of moderate size, up to 35.5 mm. (1½ inches) in length, lightly built, ovate, gradually narrowed in front, and moderately elevated, with the apex anterior to the middle, compressed and hooked. Sculptured finely and delicately radially lirate, arranged more or less in fours, the inner two weaker than the outer two, and about 100 lirae in all. Colour of exterior pale pinkish chestnut; interior orange-brown with a slight bronzy sheen; spatula pinkish white.

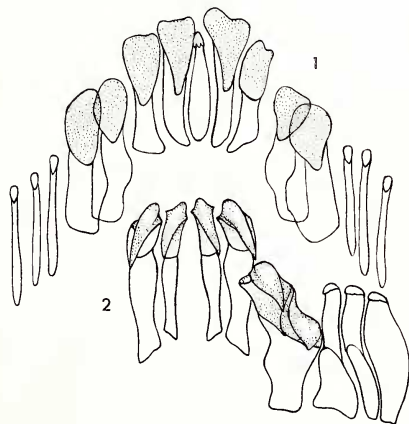


Plate 78. Fig. 1. *Patella depsta* Reeve, Island of St. Paul, Radula, from Gaillard, 1954, p. 521, fig. 1. Fig. 2. *Patella concolor* Krauss, Natal. Radula, from Koch, 1949, p. 511, fig. 22 (as *variabilis* Krauss).

Measurements (mm.)—(both A. W. B. Powell collection).

length	width	height	
35.5	28.0	14.0	St. Paul
32.25	24.0	12.0	St. Paul

Radula—Formula $3 + 2^2 + (2+1+2) + 2^2 + 3$.

Synonymy—

- 1855 *Patella depsta* Reeve, Conch. Iconica, pl. 31, figs. 85 a, b. (Jan.).
 1891 *Helcioniscus depsta* Reeve, Pilsbry, Man. Conch., vol. 13, p. 151, pl. 20, figs. 45, 46.
 1954 *Cellana depsta* Reeve, Gaillard, Bull. Mus. Nat. d'Hist. Nat., vol. 26, pp. 520, 521, text fig. 1 (radula).

Patella rangiana Rochebrune, 1882

(Pl. 75, figs. 5, 6)

Range—Porto Praya, Cape Verde Islands.

Remarks—This species, which the writer has not seen, appears to be a distinctive one, with its very scaly prominent radial ribs. Pilsbry's translation of the original description follows, accompanied by copies of Rochebrune's figures.

Description—"Shell ovate, depressed-convex, rufous; vertex submucronate, usually eroded, situated at 2/3 of the length; having larger and smaller radiating broad, very scaly ribs, scales subimbricating, obtuse, lenticular; margin undulating; interior bluish, silvery-pearly, rayed with bands and spots of purplish, the center spatulate."

Measurements (mm.)—

length	width	height	
44.0	36.0	19.0	(Rochebrune)

Synonymy—

- 1882 *Patella rangiana* Rochebrune, Bull. Soc. Philomathique, Paris, ser. 7, vol. 6, p. 29.
 1891 *Patella rangiana* Rochebrune, Pilsbry, Man. of Conch., vol. 13, p. 89, pl. 58, figs. 42, 43.

? *Patella kaffraria* Rennie, 1930

(Pl. 79)

Range—Upper Cretaceous of Pondoland, South Africa.

Remarks—The author of this species remarked that "It need hardly be stated that the genus *Patella* is here used in the widest possible sense. The species is apparently distinct from any previously described from the Cretaceous." It certainly appears to belong to the Patellacea, but a precise generic or even familial allocation would be purely conjectural. Rennie's original description follows.



Plate 79. ?*Patella kaffraria* Rennie, 1930. Upper Cretaceous of Pondoland, South Africa, 32.5 mm. Holotype, from Rennie, 1930, pl. 24, figs. 1, 2.

Description—“Shell moderately convex, with the apex obtusely pointed, not recurved, and placed well in front of the middle; the sides are straight, or only slightly convex. Aperture oval,

considerably longer than wide, with wavy margin. Surface with stout, rather irregular, radial ribs, and narrow furrows; on the posterior side the ribs are of two sizes, the larger and smaller alternating; on the anterior side there are more numerous, finer ribs; the ribs are crossed by irregular growth markings.”

Measurements (mm.) (Not stated, but evidently the figures are natural size)—

<i>length</i>	<i>width</i>	<i>height</i>	
32.5	25.0	14.0	holotype

Synonymy—

1930 *Patella kaffraria* Rennie, Annals of South African Museum, vol. 28, p. 206, pl. 24, figs. 1-4.

Types—The holotype (No. 8477) and paratype (No. 8572) are in the South African Museum.

Patella granatina Linnaeus, 1758

(Pl. 64, figs. 1-3; pl. 80; pl. 82, fig. 2)

Subgenus Patellona Thiele in Troschel, 1891Type: *Patella granatina* Linnaeus, 1758

This group of patellids was named because of a marked difference in the radula from that of typical *Patella*. The four central teeth of true *Patella* occur in a horizontal alignment whereas in *Patellona* there is a median central, narrower and of smaller size than the outer pairs of centrals, which instead of being in line, descend steeply to the laterals, their tops forming a chevron. The cusps of the centrals and laterals vary between oblique heart-shape and parrot-beaklike.

This chevron-like radula is found in species from Cape Verde Islands, Senegal, Guinea, Angola and St. Helena, as well as South Africa, where the type species *granatina* and the related *oculus* occur, these two being more or less restricted to the cooler waters of the west coast. Shells of this subgenus are slightly iridescent within and the shell substance is sufficiently transparent for the external colour patterns to show through faintly.

The northward flowing cool Benguela Current could account for the presence of the subgenus in Angola and St. Helena, but locations north of there, in the tropical waters of West Africa and the Cape Verde Islands, are, under present conditions, out of range of the influence of that current. Nevertheless the style of radula in the tropical West African and Cape Verde Islands limpets is so similar to that of the cool water species of the South African west coast that some distributional continuity, under more uniform hydrological conditions, must have existed in the past.

Related to *Patellona* is the subgenus *Cymbula* (see ahead) in which the central teeth have the same chevronlike alignment, but their cusps are distinctive in having broad blunt tops with raised marginal rims.

Synonymy—

1891 *Patellona* Thiele in Troschel, Das Gebiss der Schnecken, vol. 2, p. 317, for *granatina* Linnaeus, 1758, *adansonii* Dunker, 1853 and *plumbea* Lamarck, 1819. Type, by subsequent designation, Tomlin, 1931: *Patella granatina* Linnaeus, 1758.

Range—South Africa, Port Nolloth on the west coast, south to False Bay and extending eastward to Danger Point.

Remarks—This large but relatively thin South African limpet is easily recognised by its broadly ovate, almost pentagonal outline, strong, narrowly crested, radial ribs, and distinctive coloration of the interior which is bluish white with a clearly outlined dark-brown spatula.

Description—Shell large, up to 85 mm. (3½ inches) in length, strong but of relatively light build, broadly ovate and tall-conical, with the apex almost central. Sculpture of radiate folds that strongly corrugate the margin; five of the radials on the posterior half of the shell are stronger than the rest; radials and interspace alike bear closely-spaced cords that are rendered scabrous by dense concentric growth-lamellae. Colour of exterior greyish to dull-white with an underlying pattern of dark-brown, zigzag, concentric markings, often forming a netted design; interior bluish white, the spatula dark-chocolate, with clearly defined edges, and a marginal pattern of numerous short, dark-brown dashes, with regular gaps corresponding to the external primary radials.

Radula—Formula 3+1 + (2+1+2) + 1 + 3. The median central is small and slender, flanked by a pair of stout fully-developed centrals on either side, followed by a pluricuspid lateral, and the usual three, more or less functionless, marginals. The centrals, collectively, form a chevron, as in other members of this subgenus. The cusps of the paired centrals and the pluricuspid laterals are leaf-shaped, obliquely flexed, and with a median groove or depression.

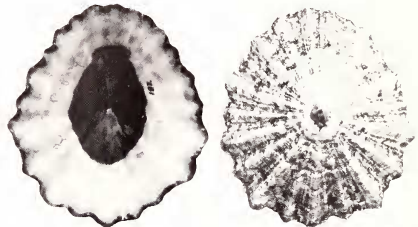


Plate 80. *Patella (Patellona) granatina* Linnaeus, 1758. Table Bay, South Africa, 71 mm., AWBP coll. 183.

Measurements (mm.)—(all A. W. B. Powell collection)

length	width	height	
85.0	78.5	30.0	South Africa
74.0	63.5	35.0	South Africa
60.0	49.5	20.0	False Bay

Synonymy—

- 1758 *Patella granatina* Linnaeus, Syst. Nat. ed. 10, p. 782.
 1819 *Patella apicina* Lamarck, Anim. sans vert., vol. 6 (1), p. 324.
 1848 *Patella granatina* Lam., Krauss, Sudaf. Moll., Stuttgart, p. 43.
 1854 *Patella granatina* Lam., Reeve, Conch. Iconica, pl. 3, figs. 4 a, b.
 1891 *Patella (Scutellastra) granatina* Lam., Pilsbry, Man. Conch., vol. 13, p. 106, pl. 62, figs. 76, 77.
 1891 *Patellona granatina* Lam., Thiele, Das Gebiss der Schnecken, vol. 2, p. 317.
 1931 *Patellona granatina* Lam., Tomlin, Ann. Natal Mus., vol. 6 (3), p. 417 (designated type of *Patellona*)
 1949 *Patella granatina* Lam., Koch, Ann. Natal Mus., vol. 11 (3), p. 501, pl. 20, figs. 1-5; text figs. 9, 10 (radula)

Records—SOUTH AFRICA: Table Bay (AWBP coll.); False Bay (AWBP coll.); Platboom, Cape Peninsula (V. Orr, 1955; ANSP); Sea Point (Mrs. N. Prior) Simonstown (AWBP coll.).

***Patella oculus* Born, 1778**

(Pl. 64, figs. 7-9; pl. 81; pl. 82, fig. 1)

Range—South Africa, west coast from near Cape Town eastward to Umhali.

Remarks—This large, depressed, broadly-ovate,

star-shaped limpet has something of the appearance of *Patella (Scutellastra) longicosta* Lamarck, but differs from it, not only in dentition, but also in coloration, for the interior of *oculus* is dark purplish brown, except for a yellowish brown spatula and a surrounding area of light bluish grey. The species is essentially a cold-water one, and is more abundant along the west coast of South Africa than to the eastward. It occurs in the Bala-noid zone, which is lower mid-tidal, but sometimes extends to and below low spring-tide level.

Description—Shell large, up to 110 mm. (4½ inches) in length, solid, depressed, broadly ovate, star-shaped, with the principal ribs strongly corrugating the margin. Sculpture consisting of about 11 primary, broad, carinated radials, plus secondary radials and interstitial threads. Colour of exterior dull-brown to blackish, but usually eroded to dull-light greyish brown; interior with a very broad dark purplish brown border, and a light bluish grey area surrounding the spatula, which is fawn to deep yellowish brown.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3, very similar to the radula of *granatina*, the central teeth having the same chevronlike alignment.

Measurements (mm.)—

length	width	height	
110.0	106.0	42.0	Cape of Good Hope
86.0	76.0	15.0	Port Elizabeth
73.0	63.0	15.0	Port Alfred
53.0	51.0	8.0	Still Bay

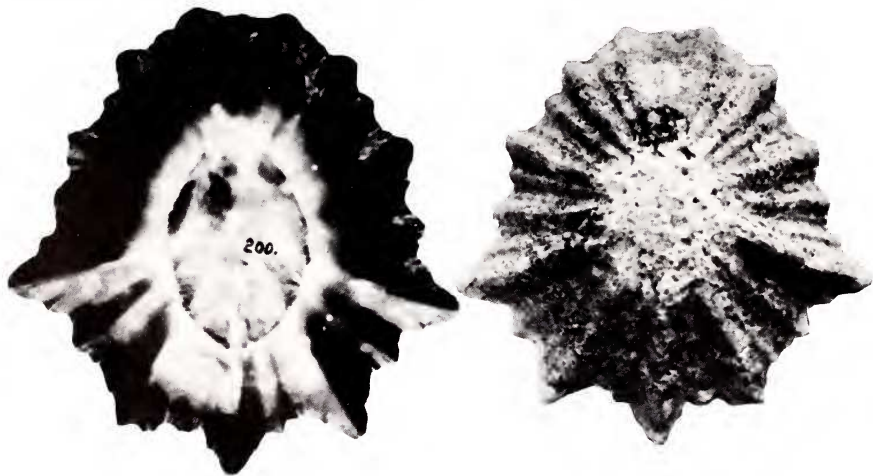


Plate 81. *Patella (Patellona) oculus* Born, 1778. Cape of Good

Hope, South Africa, 77 mm., AWBP coll. 200.

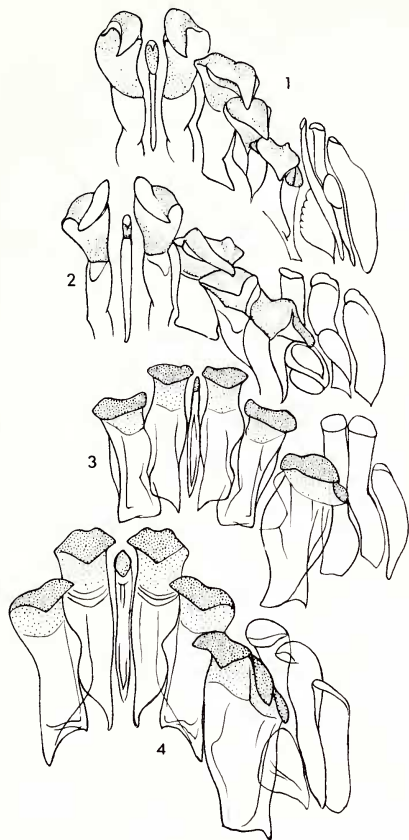


Plate 82. Fig. 1. *Patella (Patellona) oculus* Born, South Africa. Radula, from Koch, 1949, p. 508, fig. 18. Fig. 2 *Patella (Patellona) granatina* Linnaeus, South Africa. Radula, from Koch, 1949, p. 502, fig. 10. Fig. 3. *Patella (Patellona) fuscescens* Gmelin, St. Helena. Radula, from Thiele, 1891, pl. 28, fig. 7 (as *plumbea* Lamarck). Fig. 4. *Patella (Patellona) adansonii* Dunker, "Chinchao" in error, probably West Africa. Radula, from Thiele, 1891, pl. 28, fig. 8.

Synonymy—

- 1778 *Patella oculus* Born, Index Mus. Caes. Vind., p. 434.
 1786 *Patella oculus hirci* Lightfoot, Cat. Portland Mus., p. 105.
 1791 *Patella badia* Gmelin, Syst. Nat., ed. 13, p. 3700.
 1791 *Patella monopis* Gmelin, Syst. Nat., ed. 13, p. 3707.
 1791 *Patella fuscescens* Gmelin, Syst. Nat., ed. 13, p. 3701.
 1798 *Patella astrolcpas* Röding, Mus. Bolten., vol. 2, p. 12.
 1819 *Patella scutellaris* Lamarck, Anim. sans vert., vol. 6 (1), p. 328.

- 1848 *Patella schroeteri* Krauss, Südafr. Moll., Stuttgart, p. 43.
 1854 *Patella oculus* Born, Reeve, Conch. Iconica, pl. 2, figs. 2 a, b.
 1891 *Patella (Scutellastra) oculus* Born, Pilsbry, Man. Conch., vol. 13, p. 106, pl. 27, figs. 30-32.
 1932 *Patella oculus* Born, Turton, Mar. Shells Port Alfred, p. 162.
 1932 *Patella oculus badia* Gmelin, Turton, Mar. Shells Port Alfred, p. 163.
 1932 *Patella oculus fuscescens* Gmelin, Turton, Mar. Shells Port Alfred, p. 163.
 1932 *Patella oculus schroeteri* Krauss, Turton, Mar. Shells Port Alfred, p. 163.
 1932 *Patella oculus planulata* Turton, Mar. Shells Port Alfred, p. 163.
 1942 *Patella oculus* Born, Tomlin & Stephenson, Proc. Malac. Soc., Lond., vol. 25, pp. 5, 6.
 1949 *Patella oculus* Born, Koch, Ann. Natal Mus., vol. 11 (3), p. 507, pl. 22, figs. 1-4; text figs. 17, 18 (radula).
 1967 *Patella scutellaris* Lamarck, Christiaens, Bull. Mus. Nat. d'Hist. Nat. ser. 2, vol. 39 (5), p. 973.

Records—SOUTH AFRICA: west coast near Cape Town, eastward to Umhlabi (Koch, 1949, p. 507); Cape of Good Hope (AWBP coll.); False Bay (AWBP coll.); Buffel's Bay, Cape Peninsula (Mrs. N. Prior); Still Bay (Auck. Mus.); Port Elizabeth (Auck. Mus.); Jeffrey's Bay (Auck. Mus.); Port Alfred (AWBP coll.).

Patella adansonii Dunker, 1853

(Pl. 82, fig. 4; Pl. 83, figs. 5, 6)

Range—West Africa.

Remarks—This species is characterised by its dense fine radial ribbing, brown-lined and marbled external pattern, and finely denticulated margin.

Description—Shell of moderate size, 36-50 mm. (1½-2 inches) in length, ovate, the anterior end slightly narrowed, moderately elevated, with the apex at about the anterior third. Sculpture consisting of about 80 to 100 narrowly-rounded radial ribs that more or less alternate in strength. Colour, externally whitish, marbled, and radially and narrowly streaked with olive or dark greenish brown, internally pale bluish grey, with the external pattern showing through, more strongly at the margin; spatula buff to pale orange-brown.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. The five central teeth are not in a straight horizontal row as in typical *Patella*, for the outer pair of centrals are lower than the inner pair, and the median one is small, very slender and almost vestigial.

Measurements (mm.)—

length	width	height	
50.0	41.0	17.0	Pilsbry, 1891, p. 92
42.0	33.0	14.0	Angola

Synonymy—

- 1853 *Patella adansonii* Dunker, Ind. Moll. Guin. Infer., p. 42, pl. 6, figs. 10-15.
 1891 *Patella adansonii* Dunker, Pilsbry, Man. Conch., vol. 13, p. 92, pl. 12, figs. 30-33.

Records—WEST AFRICA: Loanda (type); Ambrizette, Angola (AWBP coll.; ANSP).

***Patella canescens* Gmelin, 1791**

(Pl. 82, fig. 3; Pl. 83, figs. 3, 4)

Range—St. Helena.

Remarks—The sculpture is much finer than that in either *lugubris* or *plumbea* and in consequence the shell margin is delicately crenulated rather than corrugated.

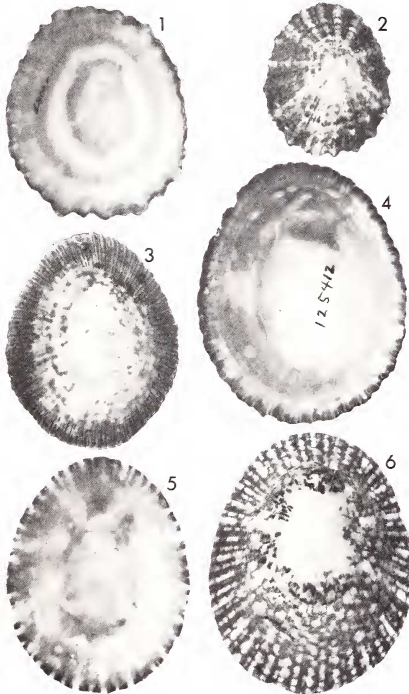


Plate 83. Figs. 1, 2. *Patella (Patellona) lugubris* Gmelin, 1791. Porto Grande, St. Vincent, Cape Verde Islands, 42-51 mm., AWBP coll. 50089. Figs. 3, 4. *Patella (Patellona) canescens* Gmelin, 1791. St. Helena, 41-15 mm., AWBP coll. 125412. Figs. 5, 6. *Patella (Patellona) adansonii* Dunker, 1853, Angola, West Africa, 36-42 mm., AWBP coll. 146139.

Description—Shell of moderate size, up to 47 mm. (1½ inches) in length, ovate, slightly narrowed in front, moderately elevated, with the apex subcentral. Sculpture crisp, consisting of very numerous radial cords, the primaries grouped in pairs or in threes, with an occasional intermediate between each group of primaries. Colour of exterior black, usually eroded to a greyish brown. Interior bluish silvery, the spatula flesh to orange-brown, and the edge of the shell narrowly margined in black.

Measurements (mm.)—

length	width	height	
47.0	40.0	20.0	St. Helena; Christiaens, 1968
45.0	37.5	20.0	St. Helena

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. Radula very similar to that of *plumbea* and *adansonii*, with the median central very small and the pairs of centrals arranged chevron-like, descending sharply from the central line. The lateral is distinctive in having four well developed cusps (Christiaens, 1968, text fig. 1).

Synonymy—

- 1791 *Patella canescens* Gmelin, Syst. Nat., ed. 13, p. 3724. Locality?
 1855 *Patella canescens* Gmelin, Reeve, Conch. Iconica, pl. 34, figs. 103 a, b. Locality?
 1968 *Patella canescens* Gmelin, Christiaens, Rev. Zool. Bot. Afr., vol. 77, pts. 3-4, pp. 314-320. St. Helena.

***Patella lugubris* Gmelin, 1791**

(Pl. 83, figs. 1, 2)

Range—West Africa, Loanda, Benguela, Guinea and Cape Verde Islands.

Remarks—The sculpture is much more coarsely ribbed than either the St. Helena *canescens* or the West African *plumbea*, and from the latter species it differs in being more broadly ovate.

Description—Shell moderately large, up to 60 mm. (2½ inches) in length, broadly ovate, moderately elevated, with the apex almost at the anterior third. Sculpture consisting of numerous strong, keeled radials that prominently corrugate the margin. Colour, externally dull-black, internally silvery bluish grey, the spatula often clouded with a white callus.

Measurements (mm.)—

length	width	height	
60.0	50.0	20.0	Pilsbry, 1891, p. 91
53.0	46.0	19.0	Cape Verde Islands

Synonymy—

- 1791 *Patella lugubris* Gmelin, Syst. Nat. ed. 13, p. 3705; based upon Martini-Chemnitz, Conch. Cab., vol. 1, pl. 8, fig. 60.
 1854 *Patella lugubris* Gmelin, Reeve, Conch. Iconica, pl. 14, figs. 32 a-c. "Island of St. Vincent, West Indies," sic. — St. Vincent, Cape Verde Islands.
 1891 *Patella lugubris* Gmelin, Pilsbry, Man. Conch., vol. 13, p. 90, pl. 12, figs. 39, 40, 41-44; pl. 57, figs. 32-35.

Patella plumbea Lamarck, 1819

(Pl. 84)

Range—Senegal, West Africa.

Remarks—This species is closely allied to *lugubris*, and when adequate material is studied, may prove to be identical. Pilsbry (*l. c.*) remarked that "the ribbing is finer than in *P. lugubris*, the shell is more elliptical, more depressed, and the central spatula of the interior is longer and narrower."

Description—Shell moderately large, up to 53 mm. (2-1/16 inches) in length, narrowly ovate, low-conical. Colour, externally dull-black, internally bluish, the spatula whitish, often clouded with brown.

Measurements (mm.)—

length	width	height	
52.0	38.0	10.5	type; Mermod. 1950, p. 692

Synonymy—

- 1819 *Patella plumbea* Lamarck, Anim. s. Vert., vol. 6, p. 325.
 1834 *Patella caerulea* Quoy and Gaimard, Voy. Astrolabe, Moll., vol. 3, p. 342, pl. 70, figs. 4-6.
 1854 *Patella plumbea* Lam., Reeve, Conch. Iconica, pl. 3, figs. 5 a, b.

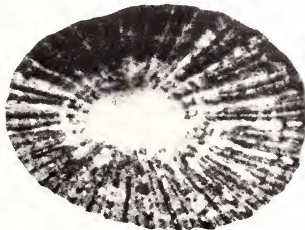


Plate 84. *Patella (Patellona) plumbea* Lamarck, 1819. Senegal, West Africa. Holotype, 52 mm., from Mermod, Rev. Suisse Zool., vol. 57, no. 34, p. 693, fig. 4.

- 1891 *Patella plumbea* Lam., Pilsbry, Man. Conch., vol. 13, p. 91, pl. 24, figs. 11, 14, 15; pl. 57, figs. 38, 39.
 1950 *Patella plumbea* Lam., Mermod. Rev. Suisse Zool., vol. 57, no. 34, pp. 692, 693, text fig. 4 (type).

Patella safiana Lamarck, 1819

(Pl. 72, figs. 3, 4)

Range—Algeria, Morocco and West Africa.

Remarks—This is a large, elongate-ovate species, only moderately elevated, and with a long narrow spatula. In coloration the exterior is whitish, with conspicuous brown rays in the rib interstices. The interior is silvery grey, with the brown external rays showing through towards the margin; the spatula is creamy-white, often stained with orange-brown.

Description—Shell large, up to 77 mm. (3 inches) in length, elongate-ovate, moderately elevated, with the apex at about the anterior third. Sculptured with broadly rounded primary radial ribs and weak interstitial cords. Colour: externally with whitish primary ribs and the interstices intermittently rayed with brown; internally buff to silvery-grey, slightly iridescent; spatula cream, clouded with light orange-brown.

Radula—Formula 3 + 1 + 4 + 1 + 3. The radula resembles that of *adansonii*, *canescens* and *plumbea*, in that the centrals are not in a horizontal line, the outer pair being lower than the inner pair. Also, a median central appears to be completely absent, as in *vulgata* (see Fischer-Piette, 1935, p. 53, text fig. 22).

Measurements (mm.)—

length	width	height	
77.0	57.0	21.0	largest of Lamarck's type series
65.0	51.0	21.0	Oran, Algeria

Synonymy—

- 1819 *Patella safiana* Lamarck, Anim. sans vert., vol. 6, p. 329.
 1849 *Patella conspicua* Philippi, Abbild., vol. 3, p. 71. Guinea.
 1852 *Patella kraussii* Dunker, Index Moll. Guin. inf., p. 42, pl. 6, figs. 4-6.
 1854 *Patella conspicua* Philippi, Reeve, Conch. Iconica, pl. 7, fig. 12. Gaboon.
 1891 *Patella safiana* Lam. Pilsbry, Man. Conch., vol. 13, p. 90, pl. 55, figs. 19-21.
 1935 *Patella safiana* Lam. Fischer-Piette, Journ. Conchyl., vol. 79, p. 53.
 1950 *Patella safiana* Lam., Mermod. Rev. Suisse Zool., vol. 57, no. 34, pp. 693, 694, text fig. 5.

Types—The type series of *safiana* is in the Muséum D'Histoire Naturelle de Genève.

Records—ALGERIA: Oran (AWBP coll.). MOROCCO: ocean coast (Pilsbry, 1891). WEST AFRICA: Gaboon, Guinea (Philippi, 1849, type of *conspicua*).

[These occasional blank areas occur between genera and subgenera to permit the insertion of new material and future sections in their proper systematic sequence.]

Subgenus *Patellidea* Thiele in Troschel, 1891

Type: *Patella granularis* Linnaeus, 1758

This subgenus, of which the type species is the only known member, appears to be most closely allied to the subgenus *Scutellastra*. The radula resembles that of *Scutellastra* in its main features, especially in having a narrow but well-developed median central, and the other 4 larger centrals in a horizontal line, but differs in the form of the cusps which are oblique and parrot-beaklike.

The shell also differs from that of *Scutellastra* in texture in being more strongly coloured, and in having distinctive external sculpture, consisting of strong radials bearing prominent imbricated scales. Recent, South Africa.

Synonymy—

1891 *Patellidea* Thiele in Troschel, Das Gebiss der Schnecken, volume 2, p. 315. Type, by monotypy: *Patella granularis* Linnaeus, 1758.

Patella granularis Linnaeus, 1758

(pl. 64, figs. 4-6, pls. 85-87)

Range—South Africa, the entire coastline from Port Nolloth in the west to Umpangazi in the east.

Remarks—This common South African species is easily identified by its scaly external ribbing and bluish white interior, broadly margined in dark-

brown, and with a reddish brown spatula.

Reeve's *Patella vidua*, erroneously recorded from the Philippines, is a synonym. A photograph of one of Reeve's figured specimens (Fig. 22a) was kindly supplied by Dr. J. D. Taylor, and that specimen, in the collections of the British Museum (Natural History), is here nominated lectotype of *vidua*.

Description—Shell of moderate size, up to 63 mm. (2½ inches) in length, ovate, slightly narrowed in front, tall-conical, with the apex slightly anterior of the centre. Sculpture of strong, regular, rounded primary radial ribs, with slightly weaker intermediates; 1 to 3 intermediates between the primary radials; all ribs with closely-spaced, imbricated, scales, resultant from numerous, lamellose concentric growth lines. Colour: externally dull light-brown to grey, with the scales paler; internally bluish white, with a dark-brown, wide, marginal border, and a reddish brown spatula. In fully grown examples the border is usually continuous, but in young shells it is interrupted by bluish white radial streaks, corresponding with the external radials.

Radula—Formula $3 + 1 + (2+1+2) + 1 + 3$. Central teeth 5, the middle member small and slender, almost vestigial, the outer pairs much larger, each with a long, pointed and incurved cusp; pluricuspid lateral with an enlarged top, bearing 4 cusps, of which the second from the proximal side is largest, and shaped like those of the central pairs; marginals 3, long, narrow and flexuous, each with a rudimentary cusp.

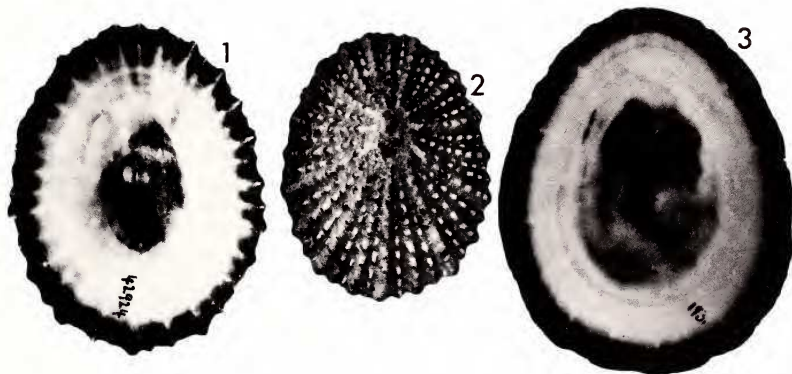


Plate 85 *Patella (Patellidea) granularis* Linnaeus, 1758. Figs. 1, 2. Plathoom, Cape Point, South Africa. Fig. 3. Cape of

Good Hope, South Africa, 37-60 mm., AWBP coll. 42924 & 193.

Measurements (mm.)—

length	width	height	
63.0	48.0	19.0	Sea Point; Mrs. N. Prior
59.0	49.0	26.0	C. of Good Hope
49.0	38.0	24.0	Platboom
44.5	36.0	17.0	Port Alfred

Synonymy—

- 1758 *Pateklla granularis* Linnaeus, Syst. Nat., ed. 10, p. 782.
 1834 *Patella granularis* L., Quoy and Gaimard, Voy. 'Astrolabe', Zool. vol. 3, p. 341, pl. 70, figs. 12-15.
 1848 *Patella granularis* L., Krauss, Sudafr. Moll., Stuttgart, p. 52.
 1848 *Patella echinulata* Krauss, Sudafr. Moll., Stuttgart, p. 52, pl. 3, fig. 15.
 1848 *Patella natalensis* Krauss, Sudafr. Moll., Stuttgart, p. 53, pl. 3, fig. 10.
 1854 *Patella vidua* Reeve, Conch. Iconica, pl. 11, figs. 22a, b.
 1854 *Patella granularis* L., Reeve, Conch. Iconica, pl. 14, figs. 31a, b.
 1855 *Patella morbida* Reeve, Conch. Iconica, pl. 25, figs. 64a, b.
 1891 *Patella (Scutellastra) granularis* L., Pilsbry, Man. Conch., vol. 13, p. 102, pl. 63, figs. 80-83.
 1891 *Patellidea granularis* L., Thiele (new genus), in Troschel & Thiele, Das Gebiss der Schnecken, col. 2, p. 315.
 1931 *Patellidea granularis* Linne', (designated type of genus) Tomlin, Ann. Natal Mus., vol. 6 (3), p. 417.
 1932 *Patella granularis* L., Turton, Mar. Shells Port Alfred, p. 166.

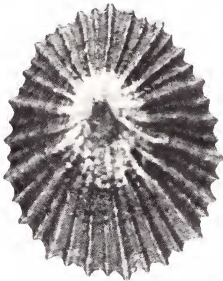


Plate 86. *Patella (Patellidea) granularis* Linnaeus, 1758. Lectotype, here nomenclated, of *Patella vidua* Reeve, 1854, erroneously recorded from the Philippines, but considered to be synonymous with the South African *granularis*. The lectotype is based upon Reeve's fig. 22a. Photo by courtesy of Dr. J. D. Taylor, British Museum (Natural History).

- 1932 *Patella morbida* Reeve, Turton, Mar. Shells Port Alfred, p. 166.
 1932 *Patella natalensis* Krauss, Turton, Mar. Shells Port Alfred, p. 166.
 1932 *Patella natalensis echinulata* Krauss, Turton, Mar. Shells Port Alfred, p. 166.
 1932 *Patella miharis* Turton, Mar. Shells Port Alfred, p. 166. (non Philippi, 1848)
 1932 *Patella argenvillei assimilans* Turton, Mar. Shells Port Alfred, p. 167.
 1932 *Patella alboradiata* Turton, Mar. Shells Port Alfred, p. 167.
 1933 *Patella tomhini* Turton, (nom. nov. pro *P. alboradiata* Turton, 1932, non Gueldin, 1791) Journ. Conch., vol. 19, p. 371.
 1949 *Patella granularis* Linne', Koch, Ann. Natal Mus., vol. II (3), p. 503, pl. 19, figs. 4-8; text figs. 11, 12 (radula).

Types—The types of *granularis* (Holotype; Sloane coll., no. 1013), *morbida* and *vidua* (lectotype, here selected) are in the British Museum (Natural History).

Records—SOUTH AFRICA: Port Nolloth to Umpangazi, north of Durban (Koch, 1949, p. 503); Saldanha Bay (Discovery II, 1926); Table Bay (AWBP coll.); Cape of Good Hope (AWBP coll. 193); Sea Point (Mrs. N. Prior); False Bay (Auck. Mus.); Platboom, Cape Point (V. Orr, Jan. 1955); Jeffrey's Bay (AWBP coll.); Port Alfred (Auck. Mus.).

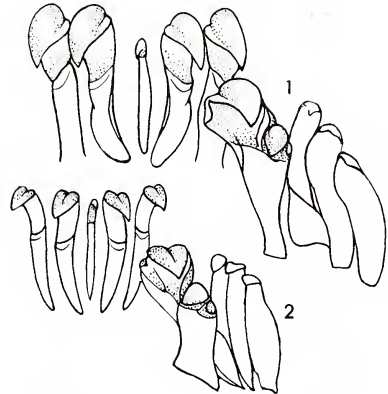


Plate 87. Fig. 1. *Patella (Patellidea) granularis* Linnaeus, South Africa. Radula. Fig. 2. *Patella (Olana) cochlear* Born. Radula, both from Koch, 1949, p. 504, fig. 12 & p. 499, fig. 6.

Subgenus *Cymbula* H. and A. Adams, 1854

Type (monotypy): *Patella compressa* Linnaeus, 1758

This subgenus contains two species, the shells of which are of very different outward appearance, but nevertheless have a striking sameness in the radula that is of a distinctive type. The multiple centrals and the pluricuspid lateral have large blunt-topped cusps, with strongly raised or flanged edges. The centrals collectively form a chevron instead of forming a horizontal line, as in typical *Patella*, and thus indicate alliance with the subgenus *Patellona*.

The type species is the easily recognised *compressa*, with its elongated, laterally compressed shell, adapted to its specialised station on the stipes of the large kelps, *Ecklonia* and *Laminaria*. Only rarely is this species found attached to rock. On the other hand, the second species, *miniata*, is of normal ovate limpet shape, since it is exclusively a rock-dweller. Both species are restricted to South African waters.

Synonymy—

1854 *Cymbula* H. Adams and A. Adams, The Genera of Recent Mollusca, volume 1, p. 466. Type, by monotypy: *Patella compressa* Linnaeus, 1758. [*Cymbula* Gray, 1821, is an error for *Cymbula* Peron and Lesner 1810].

Patella compressa Linnaeus, 1758

(pl. 63, fig. 9; Pls. 88, 89)

Range—South Africa, from Port Nolloth in the west to Danger Point in the south. Records from further afield, including one from St. Helena, are due to drift, along with large algae, upon which the species lives.

Description—Shell large, up to 117.5 mm. (4½ inches) in length, thin, elongate-ovate, tall and narrow, with parallel sides, the apex a little forward of the middle, and curving anteriorly. Sculpture consisting of very numerous, rather unequal, linear-spaced riblets; margin very minutely crenulated, convex at the sides, and concave at the ends. Colour: externally dull brownish buff; internally light pinkish fawn, the central area irregularly clouded with whitish callus.

Radula—Formula 3 + 1 + (2f1+2) + 1 + 3. Central teeth 5, forming a chevron, the median one

small and very narrow, bearing a simple small cusp, outer pairs of centrals massive, each with a broad flat-topped cusp, ridged on each side, the ridges more prominent on the outermost teeth; pluricuspid lateral with two cusps, each similar to those of the outer centrals; the three marginals are small, each with a single simple cusp, outermost marginal largest of the three.

Measurements (mm.)—

length	width	height	
117.5	51.0	50.0	Kommetje, Cape Peninsula; Mrs. N. Prior.
94.0	45.0	35.0	South Africa; Pilsbry, 1891, p. 93
83.0	44.0	36.5	South Africa
63.5	35.0	23.0	South Africa

Synonymy—

- 1758 *Patella compressa* Linnaeus, Syst. Nat. ed. 10, p. 783.
 1834 *Patella compressa* L., Quoy and Gaimard, Voy. 'Astrolabe', Zool., vol. 3, p. 338, pl. 70, figs. 1-3.
 1848 *Patella compressa* L., Krauss, Sidaf. Moll., Stuttgart, p. 50.
 1854 *Patella compressa* L., Reeve, Conch. Iconica, pl. 7, figs. 13a, b.
 1854 *Patella (Cymbula) compressa* L., H. & A. Adams, Gen. Rec. Moll., vol. 1, p. 466.
 1891 *Patella compressa* L., Pilsbry, Man. Conch., vol. 13, p. 93, pl. 61, figs. 68-70.
 1949 *Patella compressa* Linnaeus, Koch, Ann. Natal Mus., vol. 11, p. 499, pl. 17, figs. 4-6, text figs. 7, 8 (radula).

Records—SOUTH AFRICA: Port Nolloth to Danger Point (Koch, 1949, p. 499); Cape Peninsula (AWBP coll. 26039); Kommetje, Cape Peninsula (Mrs. N. Prior).

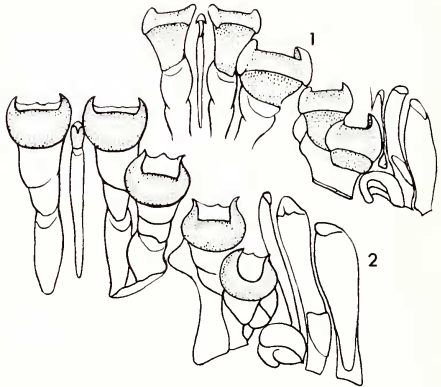


Plate 88, Fig. 1. *Patella (Cymbula) compressa* Linnaeus. South Africa. Radula, from Koch, 1949, p. 500, fig. 8. Fig. 2. *Patella (Cymbula) miniata* Boru. South Africa. Radula, from Koch, 1949, p. 507, fig. 16.

***Patella miniata* Born, 1778**

(Pl. 63, figs. 10, 11, Pls. 88, 90, 91)

Range—South Africa, from Port Nolloth in the west, eastward to Qolora, near East London, and Natal.

Remarks—This moderately large, very attractive limpet is ovate, depressed and relatively thin, with an intricate pattern of radial streaks and speckles; it is reddish brown in living examples, but bleached to bright-pink in shells from beach drift. Pilsbry (1891, p. 93) was incorrect in assuming that *miniata* is merely a rock-dwelling ecotype of the kelp living *compressa*.

Description—Shell rather large, up to 93 mm. (3 $\frac{3}{8}$ inches) in length, strong but relatively thin, ovate, slightly attenuated in front, rather depressed, and with the apex varying between sub-

central and the anterior third. Sculpture consisting of numerous primary radial cords, with mostly two radial threads in the interspaces; the ribbing varies in strength, and may be almost smooth to sharply-imbriated by dense concentric growth threads. Colour: externally radially streaked and speckled in reddish brown to bright-pink, on a white ground; internally silvery pinkish white, with the external pattern showing through strongly; spatula white-callused, sometimes tinged with orange. Living examples are usually encrusted.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. The radula stands nearest to that of *compressa*, the arrangement of the teeth being the same. The only noticeable difference between the two is in the shape of the cusps which have convex cutting edges in *miniata* but straight to concave ones in *compressa*.

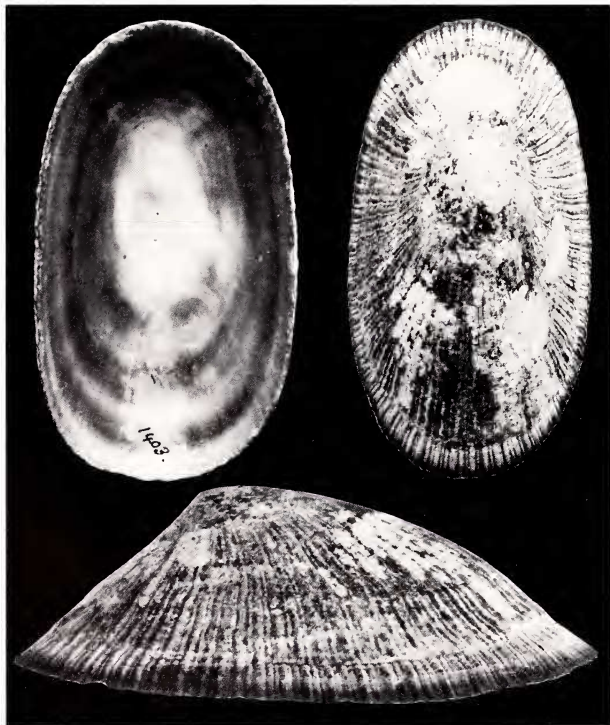


Plate 89. *Patella (Cymbula) compressa* Linnaeus, 1758. South Africa, 64-83 mm., AWBP coll. 1403 & 17985.

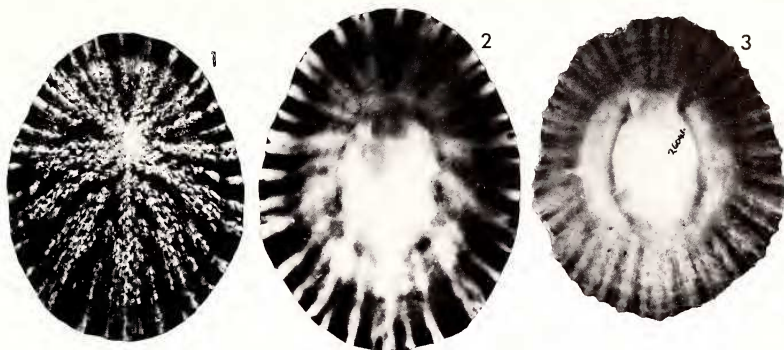


Plate 90. Figs. 1-3. *Patella (Cymbula) miniata* Born, 1778, South Africa. Figs. 1, 2. Port Nolloth, 75 mm., AWBP coll.

52455. Fig. 3. False Bay, 79 mm., AWBP coll. 26041.

Measurements (mm.)—

length	width	height	
93.0	71.5	22.0	Natal; Mrs. N. Prior.
79.0	66.0	20.0	False Bay
75.0	56.5	16.0	Port Nolloth
54.0	43.5	12.0	Still Bay

Synonymy

- 1778 *Patella miniata* Born, Index Mus. Caes. Vindl., p. 436; 1780, Test. Mus. Caes. Vindl., p. 420.
 1786 *Patella pulchra* Lightfoot, Cat. Portland Mus., p. 105.
 1791 *Patella umbella* Gmelin, Syst. Nat., ed. 13, p. 3706.
 1791 *Patella sanguinolenta* Gmelin, Syst. Nat., ed. 13, p. 3716.
 1798 *Patella rosea* Röding, Mus. Bolten., vol. 2, p. 9.
 1798 *Patella rubicunda* Röding, Mus. Bolten., vol. 2, p. 9.
 1848 *Patella miniata* Born, Krauss, Sudafr. Moll., Stuttgart, p. 51.
 1854 *Patella sanguinans* Reeve, Conch. Iconica, pl. 6, fig. 10.
 1854 *Patella umbella* Gmelin, Reeve, Conch. Iconica, pl. 9, figs. 17a, b.
 1891 *Patella compressa* var. *miniata* Born, Pilsbry, Man. Conch., vol. 13, p. 94, pl. 26, figs. 22-27.
 1932 *Patella miniata* Born, Turton, Mar. Shells Port Alfred, p. 168.
 1932 *Patella miniata umbella* Gmelin, Turton, Mar. Shells Port Alfred, p. 168.
 1932 *Patella miniata decorata* Turton, Mar. Shells Port Alfred, p. 169, pl. 39, fig. 1199.
 1932 *Patella pulchella* Turton, Mar. Shells Port Alfred, p. 169, pl. 39, fig. 1200. (non Blainville, 1825).
 1932 *Patella alboguttata* Turton, Mar. Shells Port Alfred, p. 169, pl. 39, fig. 1202.
 1932 *Patella denseplicata* Turton, Mar. Shells Port Alfred, p. 169, pl. 39, fig. 1205.
 1932 *Patella densistriata* Turton, Mar. Shells Port Alfred, p. 170, pl. 39, fig. 1206.
 1933 *Patella becki* Turton, Journ. Conch., vol. 19, p. 371; nom. nov. pro *P. pulchella* Turton, 1932, non Blainville, 1825.

- 1942 *Patella sanguinolenta* (sic Gmelin, Tomlin & Stephenson, Proc. Malac. Soc., Lond., vol. 25, p. 7.
 1949 *Patella miniata* Born, Koch, Ann. Natal Mus., vol. 11 (3), p. 506, pl. 21, figs. 1-12; text figs. 15a, b, 16 (radula).

Records—SOUTH AFRICA: Port Nolloth in the west to Qolora in the east, common in the sub-littoral fringe (Koch, 1949, p. 506); Port Nolloth; False Bay; Still Bay; Port Elizabeth; Algoa Bay (all AWBP coll.); Natal (Mrs. N. Prior).

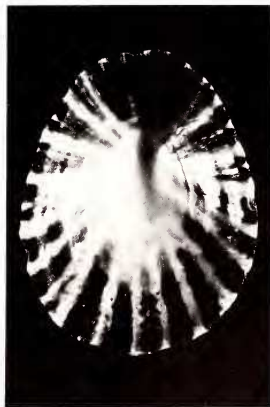


Plate 91. *Patella (Cymbula) miniata* Born, 1778. Natal, South Africa; An extra large and fine example of the species, in the collection of Mrs. Nancy Prior of Cape Town. It has a length of 93 mm. (3½ inches).

[These occasional blank areas occur between genera and subgenera to permit the insertion of new material and future sections in their proper systematic sequence.]

Patella cochlear Born, 1778

(Pl. 63, figs. 12-14; Pls. 57, 92)

Range—South Africa, from Buffalo River on the west coast and around the Cape of Good Hope to Port Edward, Natal.

Description—Shell of moderately large size, up to 67 mm. (2½ inches) in length, solid, depressed, pear-shaped, with the anterior end much constricted, and produced like a spout. Sculptured with strong, rather unequal radial ridges that deeply corrugate the margin. Colour: externally white to yellowish brown; internally white, tinged with bluish grey; the spatula fawn, orange-brown, or clouded with white, and surrounded, except in front of the head region, with a broad band of indigo.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. The small, slender, median central tooth, and the two pairs of multiple centrals form a horizontal line, as in true *Patella*, but the massive lateral has four cusps, two of them large and the other two much smaller. The cusps are heart-shaped, with a pronounced groove down the middle; marginals 3, each with a weak cusp.

Measurements (mm.)—(all A. W. B. Powell collection).

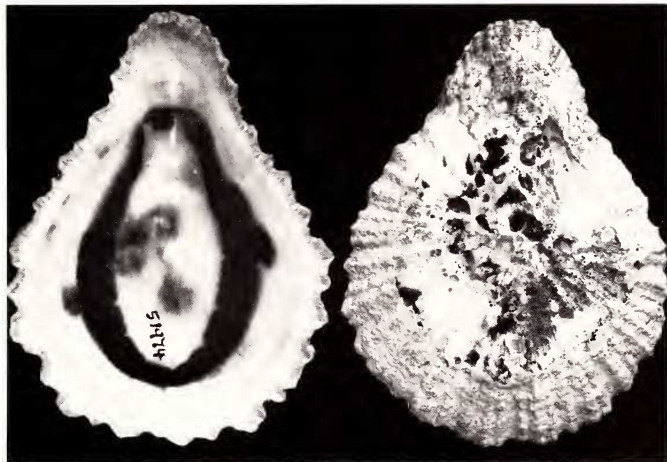
length	width	height	
67.0	50.0	17.0	Port Alfred
58.5	43.5	15.5	Cape Natal
45.0	34.5	6.0	False Bay

Subgenus Olana H. and A. Adams, 1854Type (monotypy): *Patella cochlear* Born, 1778

A moderate-sized shell of depressed pear-shape, with the anterior end laterally constricted and produced like a spout. The sole species of this subgenus is restricted to South Africa where in many places it is so abundant that it forms a dense mosaic, termed the "Cochlea zone." A density of 1,300 examples to the square-yard has been recorded, and as many as 40 crowded on top of a single large shell. Almost all large examples bear several deeply excavated scars, resultant from superimposed individuals. These limpets do not appear to move around much, but merely rotate, so that the head can move in a circle and the radula crop the algal growth within its range (See Koch, 1949, pp. 498-499).

Synonymy—

1854 *Olana* H. and A. Adams, The Genera of Recent Mollusca, vol. 1, p. 466. Type by monotypy: *Patella cochlear* Cmelin, 1791 = Born, 1778.

Plate 92. *Patella (Olana) cochlear* Born, 1778, Port Alfred,

South Africa, 66 mm., AWBP coll. 51974.

Synonymy—

- 1778 *Patella cochlear* Born, Index Mus. Caes. Vind., p. 437;
1780, Test. Mus. Caes. Vind., pl. 18, fig. 3, p. 420.
- 1790 *Patella cochlear* Born, Gmelin, Syst. Nat. ed. 13,
p. 3721.
- 1848 *Patella cochlear* Born, Krauss, Sudaf. Moll., Stuttgart,
p. 48.
- 1854 *Patella cochlear* Born, Reeve, Conch. Iconica, pl. 12,
figs. 24a, b.
- 1854 *Patella (Olana) cochlear* Born, H. & A. Adams, Gen.
Rec. Moll., vol. 1, p. 466.
- 1891 *Patella (Scutellastra) cochlear* Born, Pilsbry, Man.
Conch., vol. 13, p. 104, pl. 27, figs. 34, 35.
- 1949 *Patella cochlear* Born, Koch, Ann. Natal Mus., vol. 11
(3), p. 498, pl. 19, figs. 1-3; text figs. 5, 6 (radula).

Records—SOUTH AFRICA: False Bay; Sea Point (Mrs. N. Prior); Port Elizabeth; Cape Natal; Port Alfred (all AWBP coll.).

Subgenus *Scutellastra* H. and A. Adams, 1854

Type: *Patella barbara* Linnaeus, 1758

Mostly large massive shells with an opaque, non-iridescent, porcellaneous interior. The external coloration is either a uniform spread of colour, or the pigment may be confined to the spaces between the radial ribs and show through to the inside margin to form a narrow border where the shell is thinnest.

Radula and gill cordon as in typical *Patella*, but the median central tooth is usually well-developed, often as large as the other four centrals.

The range of the subgenus is South Africa, on across the Indo-Pacific as far east as the Society Islands, northward to Japan and along the south coast of Australia. Undoubted fossil occurrences of the subgenus are *cooperi* (Powell, 1938) from the lower Miocene of Motuili Island, Auckland, New Zealand, and *aurorae* Fleming, 1973, from the middle Oligocene of Mason River, North Canterbury, New Zealand.

Synonymy—

1854 *Scutellastra* H. Adams and A. Adams, The Genera of Recent Mollusca, volume 1, p. 466, for *gorgonica* Humphrey, *pentagona* Born and *plicata* Born. Type, by subsequent designation, Powell, 1938: *Patella gorgonica* Humphrey = *P. longicosta* Lamarck" (sic) = *Patella barbara* Linnaeus, 1758.

1924 *Patellanax* Iredale, Proceedings of the Linnean Society of New South Wales, volume 49, part 3, p. 239. Type, by original designation: *Patella squamifera* Reeve, 1855.

1929 *Pencapatella* Iredale, Memoirs of the Queensland Museum, volume 9, part 3, p. 276. Type, by original designation: *Pencapatella inquisitor* Iredale, 1929.

Patella argenvillei Krauss, 1848

(Pl. 65, fig. 4; Pl. 93, 96)

Range—South Africa: Port Nolloth on the west coast, eastward to Qolora, between East London and Durban.

Remarks—This species is more common on the west coast where it forms concentrated low-tidal communities, termed the Cochlear-argenvillei zone. It is one of the least variable of South African lim-

pets, easily recognised by its narrowly elongate-oval, high-conical form, dense regular sculpture, and dark external coloration, with white linear rib interstices.

Description—Shell large, up to 89 mm. (3½ inches) in length, rather solid, oblong-ovate, slightly constricted at the anterior end, high conical, with the apex subcentral, a little nearer to the anterior end. Sculpture consisting of very numerous, over 100, more or less regular, flat-topped radial ribs, with linear interstices; margin delicately and evenly crenulated. Colour: externally blackish, the rib interstices white; internally white, dark-greyish between the marginal crenulations, and spatula diffused with yellowish brown.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. Central teeth consisting of a narrow insignificant middle member, with a pair of strong, sharply-cusped and centrally-grooved teeth on each side; lateral massive, with an expanded top, bearing four sharp cusps, the middle two deeply grooved; marginals three, weakly cusped and slender.

Measurements (mm.)—

length	width	height	
89.0	68.0	52.0	Table Bay
77.0	58.0	35.5	South Africa
63.0	44.5	30.0	Port Elizabeth

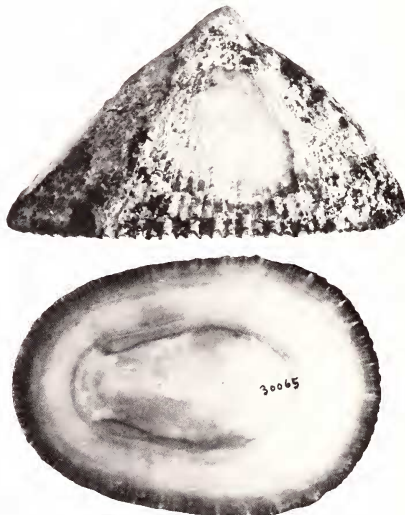


Plate 93. *Patella (Scutellastra) argenvillei* Krauss, 1848. Port Alfred, South Africa, 72.77 mm., AWBP coll. 30065.

Synonymy—

- 1848 *Patella argenvillei* Krauss, Sudaf. Moll., Stuttgart, p. 49; based upon Argenville Conch., 1870, vol. 1, p. 504 and vol. 3, pl. 3, fig. G.
 1854 *Patella argenvillei* Krauss, Reeve, Conch. Iconica, pl. 10, figs. 20a, b.
 1891 *Patella (Scutellastra) argenvillei* Krauss, Pilsbry, Man. Conch., vol. 13, p. 95, pl. 22, figs. 15, 16; pl. 58, fig. 44.
 1949 *Patella argenvillei* Krauss, Koch, Ann. Natal Mus., vol. 11(3), p. 494, pl. 17, figs. 1-3; text figs. 1, 2 (radula).

Records—SOUTH AFRICA: Table Bay (AWBP coll.); False Bay (AWBP coll.); Sea Point (Mrs. N. Prior); Port Elizabeth (Auck. Mus.); Port Alfred (AWBP coll.).

Patella barbara Linnaeus, 1758

(Pl. 65, figs. 1-3, Pls. 94-96)

Range—South Africa, the whole length of the coastline from Port Nolloth in the west to Umpan-gazi in the east.

Remarks—This is a large, solid, ovate limpet, varying greatly in height, but always strongly radially ridged, resulting in a deeply corrugated margin. The coloration is buff to pale brownish externally and white within, except for the spatula, which is often blotched with reddish brown.

Description—Shell rather large, up to 95 mm. (3½ inches) in length, of only moderate height and weight in its younger stages but tall and crass in mature examples, narrowly to broadly ovate, with the apex near central. Sculpture variable, but always strongly and coarsely radially ribbed, their terminal points corrugating the margin, sometimes almost as

strongly as in *longicosta*. Radial ribs carinated and of varying strength, from 10 to 20 primaries and 1 to 4 secondaries in the interspaces, the whole rendered noticeably scabrous by close set, lamellose, concentric growth marks. The posterior end of the shell usually has 5 ribs much stronger than the rest. Colour: externally dull-buff to light yellowish brown; internally whitish, often with a narrow, pale-fawn, marginal border; spatula either irregularly blotched with reddish-brown, or callused over with white. A variable species, as shown by the lengthy synonymy.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3, similar to that of both *longicosta* and *cochlear* in the form of the massive lateral, which has an expanded head, bearing three cusps, the middle one much the larger, and there is an incipient fourth cusp on the outer side. The five centrals have the middle member small and slender, with a minute vestigial cusp, but the cusps of the outer pairs of centrals, and the middle member of the laterals have broad flat tops, with ridged margins; marginals 3, slender, flexuous, and each with a weak cusp.

Measurements (mm.)—

length	width	height	
95.0	81.0	37.0	Buluga Bay, East London, Mrs. N. Prior
95.0	70.0	31.0	var. <i>ovalis</i> Pilsbry, 1891, p. 97
84.5	61.5	31.5	Still Bay
79.0	58.0	38.0	C. of Good Hope
79.0	62.0	22.5	Port Alfred
72.0	60.0	27.0	Pilsbry, 1891, p. 96

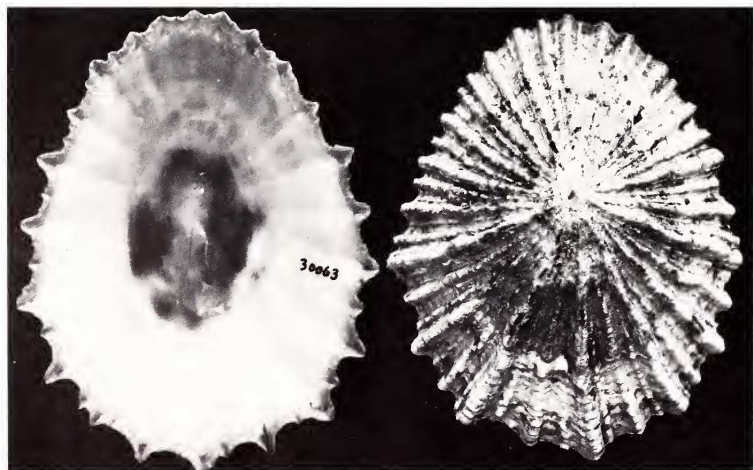


Plate 94 *Patella (Scutellastra) barbara* Linnaeus, 1758. Port

Alfred, South Africa, 76 mm., AWBP coll. 30063.

Synonymy—

- 1758 *Patella barbara* Linnaeus, Syst. Nat., ed. 10, p. 782.
 1778 *Patella plicata* Born, Mus. Caes. Vind., p. 433; 1780, Test. Mus. Caes. Vind., p. 417, pl. 18, fig. 1.
 1786 *Patella fungoides* Lightfoot, Cat. Portland Mus., p. 55.
 1786 *Patella gorgonica* Lightfoot, Cat. Portland Mus., p. 105.
 1791 *Patella plicaria* Gmelin, Syst. Nat., ed. 13, p. 3708.
 1791 *Patella cypria* Gmelin, Syst. Nat., ed. 13, p. 3698.
 1819 *Patella barbata* Lamarck, Anim. sans vert., vol. 6 (1), p. 326.
 1819 *Patella spinifera* Lamarck, Anim. sans vert., vol. 6 (1), p. 326.
 1848 *Patella barbara* L., Krauss, Sudaf. Moll., Stuttgart, p. 45.
 1848 *Patella obtecta* Krauss, Sudaf. Moll., Stuttgart, p. 47, pl. 3, fig. 11.
 1854 *Patella plicata* Born, Reeve, Conch. Iconica, pl. 9, figs. 16a, b.
 1891 *Patella (Scutellastra) barbara* L., Pilsbry, Man. Conch., vol. 13, p. 96, pl. 15, figs. 1, 2; pl. 59, figs. 50-55.
 1891 *Patella (Scutellastra) barbara* var. *ovalis* Pilsbry, Man. Conch., vol. 13, p. 97, pl. 60, figs. 56-58.
 1932 *Patella barbara* L., Turton, Mar. Shells Port Alfred, p. 163, sp. 1162.
 1932 *Patella barbara plicata* Born, Turton, Mar. Shells Port Alfred, p. 163.
 1932 *Patella whitechurchi* Turton, Mar. Shells Port Alfred, p. 164, pl. 37, fig. 1165.
 1932 *Patella thetis* Turton, Mar. Shells Port Alfred, p. 164, pl. 37, fig. 1166.
 1932 *Patella hera* Turton, Mar. Shells Port Alfred, p. 164, pl. 37, fig. 1167.
 1932 *Patella amphitrite* Turton, Mar. Shells Port Alfred, p. 164, pl. 37, fig. 1168.
 1932 *Patella amphitrite* var. *brunescens* Turton, Mar. Shells Port Alfred, p. 164, pl. 37, fig. 1169.
 1932 *Patella decemcostata* var. *major* Turton, Mar. Shells Port Alfred, p. 165, pl. 38, fig. 1171.
 1932 *Patella nympha* Turton, Mar. Shells Port Alfred, p. 165, pl. 38, fig. 1174.
 1932 *Patella sowerbyi* Turton, Mar. Shells Port Alfred, p. 166, pl. 38, fig. 1176.

1949 *Patella barbara* Linne, Koch, Ann. Natal Mus., vol. 11 (3), p. 496, pl. 18, figs. 1-12; text figs. 3a, b, 4 (radula).

Records—SOUTH AFRICA: whole length of coastline from west to east (Koch, 1949, p. 496); Table Bay (Auck. Mus. 3081); Cape of Good Hope; Still Bay; False Bay; Port Alfred; Cape Natal (all AWBP coll.).

Patella longicosta Lamarck, 1819

(Pl. 65, figs. 5-7; Pls. 95, 96)

Range—South Africa, from Oudekraal, west side of Cape Peninsula, eastward to Umpangazi, north of Durban.

Remarks—This species is easily recognised by its depressed star-shape, with the primary ribs extending well-beyond the margin, which is narrowly bordered in black. This species occurs commonly in the lower Balanoid and Cochlear zones.

Description—Shell rather large, up to 76 mm. (3 inches) in length, solid, depressed, stellate, very strongly sculptured with sharply carinated, radial ridges, that project well-beyond the margin, seven of them much stronger than the rest; apex at anterior third to submedian. Colour of exterior dull-black, when not eroded, to a rusty-brown; interior bluish white, with a narrow black margin, and a yellowish brown spatula, the latter clouded with a white callus in senile specimens.

Radula—Formula $3+1+(2+1+2)+1+3$, somewhat similar to that of *cochlear* in the form of the cusps, which are leaf-shaped with a median groove, and in the massive lateral that has four cusps.

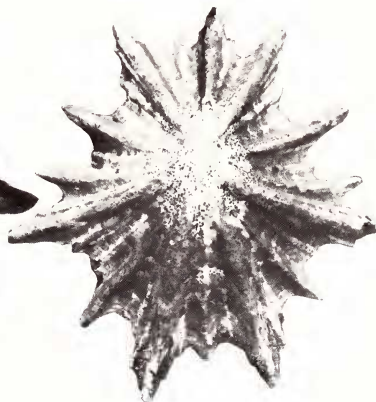


Plate 95. *Patella (Scutellastra) longicosta* Lamarck, 1819. Mossel Bay, Cape Peninsula, South Africa, 66 mm., AWBP

coll. 42429.

Measurements (mm.)—

length	width	height	
75.5	75.5	23.0	False Bay
70.0	64.0	18.0	False Bay
61.0	56.0	12.0	Cape Peninsula

Synonymy—

- 1819 *Patella longicosta* Lamarck, Anim. sans vert., vol. 6 (1), p. 326.
 1842 *Patella longicosta* Lam., Reeve, Conch. Syst., vol. 2, p. 15, pl. 136, fig. 6.
 1848 *Patella longicosta* Lam., Krauss, Sudaf. Moll., Stuttgart, p. 48.
 1854 *Patella longicosta* Lam., Reeve, Conch. Iconica, pl. 6, figs. 11a, b.
 1891 *Patella (Scutellastra) longicosta* Lamarck, Pilsbry, Man. Conch., vol. 13, p. 107, pl. 28, figs. 37, 38.

- 1901 *Patella decemcostata* E. A. Smith, Journ. Conch., vol. 10, p. 106, pl. 1, fig. 22.
 1932 *Patella longicosta* Lam., Turton, Mar. Shells Port Alfred, p. 161, pl. 37, fig. 1145.
 1932 *Patella longicosta intermedia* Turton, Mar. Shells Port Alfred, p. 161, pl. 37, fig. 1146.
 1932 *Patella multiradiata* Turton, Mar. Shells Port Alfred, p. 161, pl. 37, fig. 1147.
 1932 *Patella tabularis* Krauss, Turton, Mar. Shells Port Alfred, p. 161. (non Krauss, 1848; in part, smaller of two examples).
 1932 *Patella tabularis angulosa* Gmelin, Turton, Mar. Shells Port Alfred, p. 161, sp. 1150. (non Gmelin, 1791).
 1932 *Patella tabularis monopsis* Gmelin, Turton, Mar. Shells Port Alfred, p. 162. (sic; non *monopsis* Gmelin, 1792).
 1932 *Patella tabularis squamosa* Gmelin, Turton, Mar. Shells Port Alfred, p. 161, sp. 1149. (non Gmelin, 1791).
 1932 *Patella granatina* Linn. Turton, Mar. Shells Port Alfred, p. 163, sp. 1161. (non Linnaeus, 1758).
 1932 *Patella decemcostata* E. A. Smith, Turton, Mar. Shells Port Alfred, p. 165.
 1932 *Patella albanyana* Turton, Mar. Shells Port Alfred, p. 165, pl. 38, fig. 1175.
 1933 *Patella longicosta kowiczensis* Turton, Journ. Conch., vol. 19, p. 371; nom. nov. pro *P. longicosta intermedia* Turton, 1932, non Knapp, 1857.
 1942 *Patella longicosta* Lam., Tomlin and Stephenson, Proc. Malac. Soc., Lond., vol. 25, pp. 4-9.
 1949 *Patella longicosta* Lam., Koch, Ann. Natal Mus., vol. 11 (3), p. 504, pl. 20, figs. 6-13; text figs. 13a-c, 14 (radula).

Records—SOUTH AFRICA: Cape Peninsula (AWBP coll.); Kommetje, Cape Peninsula (Mrs. N. Prior); Mossel Bay, Cape Peninsula (V. Orr, 1955; ANSP); False Bay (AWBP coll.); Still Bay (Auck. Mus.); Simon's Bay (V. Orr, 1955; ANSP); Port Elizabeth (Auck. Mus.); Cape Natal (AWBP coll.); Port Alfred (AWBP coll.).

Types—The type series of three examples of *longicosta* is in the Muséum D'Histoire Naturelle de Genève.

Patella tabularis Krauss, 1848

(Pl. 66, fig. 5; Pls. 96, 97)

Range—South Africa, from Cape Peninsula eastward to Port St. John's.

Remarks—This is the largest of the South African limpets; it somewhat resembles *kermadecensis* but has much more prominent radial sculpture. The species inhabits the sub-littoral fringe, and does not occur in dense communities (Koch, 1949, p. 509).

Description—Shell very large and massive, up to 147.5 mm. (5¾ inches) in length, broadly ovate, moderately elevated, and with the apex anterior to the middle. Sculpture heavy and coarse, consisting of 9, 10 or more heavy, foldlike, radial ribs, and numerous secondary ribs of several sizes, the whole imbricated by dense lamellose growth lines; margin deeply and somewhat irregularly scalloped. Colour: exterior dull reddish or rusty-brown; interior porcellanous-white, with a moderately wide border of reddish brown, being the external colour showing through at the thinner margin; spatula not differentiated by colour.

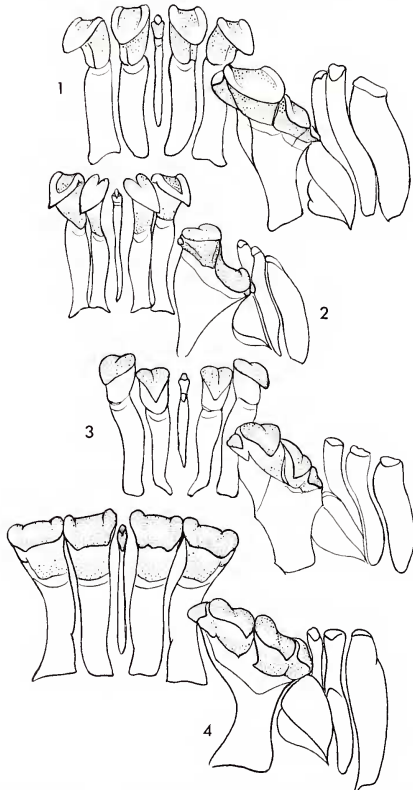


Plate 96. Fig. 1. Radula of *Patella (Scutellastra) barbara* Linnaeus. Fig. 2. *Patella (Scutellastra) longicosta* Lamarck. Fig. 3. *Patella (Scutellastra) argenteilei* Krauss. Fig. 4. *Patella (Scutellastra) tabularis* Krauss. South Africa. Radulae, all from Koch, 1949.

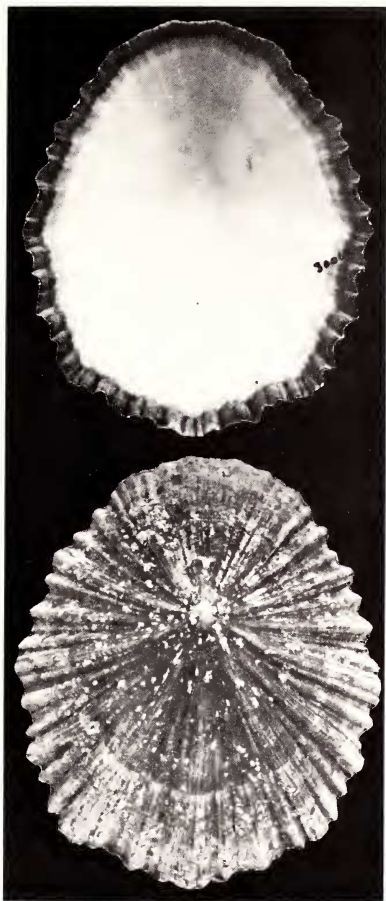


Plate 97. *Patella (Scutellastra) tabularis* Krauss, 1848. Port Alfred, South Africa, 115 mm., AWBP coll. 30062.

Measurements (mm.)—

length	width	height	
147.5	125.5	50.0	Buluga Bay, East London; Mrs. N. Prior
127.0	111.9	46.0	South Africa
114.0	98.0	32.0	Cape Point
81.0	68.0	20.5	Port Alfred

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. Central teeth consisting of a slender, almost vestigial, middle member, flanked by pairs of large, blunt-cusped

teeth; lateral massive, with an expanded head, bearing four cusps, the middle pair the stronger; marginals three, narrow and slender, each with a weak cusp.

Synonymy—

- 1848 *Patella tabularis* Krauss, Südafr. Moll., Stuttgart, p. 47, pl. 3, fig. 8.
 1854 *Patella rustica* L., Reeve, Conch. Iconica, pl. 5, figs. 8a, b, (non Linnaeus, 1758).
 1891 *Patella (Scutellastra) tabularis* Krauss, Pilsbry, Man. Conch., vol. 13, p. 105, pl. 16, figs. 9, 10.
 1891 *Patella (Scutellastra) patriarcha* Pilsbry, Man. Conch., vol. 13, p. 105, pl. 64, figs. 84, 85; pl. 65, fig. 86.
 1932 *Patella rustica* L., Turton, Mar. Shells Port Alfred, p. 162, sp. 1154.
 1932 *Patella tabularis* Krauss, Turton, Mar. Shells Port Alfred, p. 161, sp. 1148 (in part; larger of two specimens).
 1932 *Patella oblecta* Krauss Turton, Mar. Shells Port Alfred, p. 162, sp. 1155, (non Krauss).
 1932 *Patella patriarcha* Pilsbry, Turton, Mar. Shells Port Alfred, p. 162, sp. 1153.
 1942 *Patella tabularis* Krauss Tomlin and Stephenson, Proc. Malac. Soc., Lond. vol. 25 (1), p. 5.
 1949 *Patella tabularis* Krauss, Koch, Ann. Natal Mus., vol. 11 (3), p. 509, pl. 22, figs. 5-11; text figs. 19a, b, 20 (radula).

Types—The type of *tabularis* is in the Stuttgart Museum, formerly the Naturalien Cabinet.

Records—SOUTH AFRICA. Cape Peninsula to Port St. John's (Koch, 1949, p. 509); Cape Point (AWBP coll.); Port Alfred (AWBP coll.); Buluga Bay, East London (Mrs. N. Prior).

Patella exusta Reeve, 1854

(Pl. 98, fig. 1; Pl. 104, fig. 3)

Range—Mauritius.

Remarks—The typical subspecies seems to be confined to Mauritius, although the wider-ranging subspecies *pica* Reeve, sometimes occurs along with it. The distinctive character of *exusta* is the dull-black, thick outer layer of the shell, which also produces the narrow, black internal border. It is unfortunate that the better known name, *chitonoides* has to fall as a synonym of *exusta*.

Description—Shell of moderate size, up to 54 mm. (2½ inches) in length, solid, rather depressed, elongate-ovate, and decidedly narrowed anteriorly. Apex subcentral to about the anterior third. Sculpture consisting of about 20 narrow sharply raised primary radial ribs, and 3 or 4 weak radial threads in the wider interspaces, over the posterior half of the shell. The margin is broadly and shallowly corrugated. Colour of exterior, when not encrusted or abraded, uniformly dull black; interior pale bluish to pinkish white, with a narrow black margin. The spatula is weakly defined, and sometimes partly clouded by a pale fawn callus.

Measurements (mm.)—

length	width	height	
54.0	38.0	13.0	syntype of <i>chitonoides</i>
53.0	44.0	14.0	lectotype of <i>exusta</i>
48.0	38.0	16.0	Mauritius
47.0	37.75	11.5	lectotype of <i>chitonoides</i>
45.0	35.0	12.5	Mauritius

Synonymy—

- 1854 *Patella exusta* Reeve, Conch. Iconica, pl. 15, figs. 35a, b. (locality unknown).
 1854 *Patella chitonoides* Reeve, Conch. Iconica, pl. 21, figs. 52a, b. (locality unknown), Dec. 1854.
 1891 *Patella (Scutellastra) exusta* Reeve, Pilsbry, Man. Conch. vol. 13, p. 98, pl. 24, figs. 9, 10.
 1891 *Patella (Scutellastra) pica* form *chitonoides* Reeve, Pilsbry, Man. Conch., vol. 13, p. 98, pl. 26, figs. 28, 29.

Types—The types of both *exusta* and of *chitonoides* are in the British Museum (Natural History). That of *exusta* consists of three syntypes glued to a tablet. One of these, measuring 53 x 44 x 14 mm., matches Reeve's figure, pl. 15, fig. 35, and is here nominated lectotype. The other two specimens on the tablet are the Californian *Acmaea pelta* Eschscholtz, and may have been added later than Reeve. The type series of *chitonoides* also consists of three syntypes, and the one matching Reeve's fig. 52,

measuring 47 x 37.75 x 11.5 mm. is here nominated lectotype.

Records—Locality unknown for the types of both *exusta* and *chitonoides*. MAURITIUS: (AWBP coll.); Vacoas Point, 3 miles south of Mahébourg (Ruth Ostheimer and Virginia Orr, Nov. 20, 1960).

***Patella exusta*
subspecies *pica* Reeve, 1854**

(Pl. 98, figs. 2-4)

Range—Islands of the Indian Ocean, Mauritius to Seychelles.

Description—Shell of similar size and shape to *exusta* typical, being elongated and noticeably narrowed anteriorly, but the coloration is different, for instead of the whole of the outer surface being black, that colour is confined to radiate lines or streaks, often short and intermittent, and present only in the primary rib interstices, the rest of the exterior of the shell being white. Internally the shell is porcellanous-white with the spatula irregularly stained orange-brown, and at the margin the dark external pattern shows through, forming an intermittent narrow border.

Measurements (mm.)—

length	width	height	
49.5	38.00	14.0	lectotype
47.0	37.25	10.0	Mauritius
44.5	36.25	10.5	Mahé, Seychelles
38.0	30.00	6.5	Mauritius
30.4	26.00	5.0	Seychelles

Synonymy—

- 1854 *Patella pica* Reeve, Conch. Iconica, pl. 19, figs. 45a-c.
 1891 *Patella (Scutellastra) pica* Reeve, Pilsbry, Man. Conch., vol. 13, p. 97, pl. 22, figs. 9, 10, 13, 14; pl. 59, figs. 47-49 (not pl. 26, figs. 28, 29).
 1863 *Patella moreli* Deshayes, Cat. Moll. Réunion, p. 43, pl. 6, fig. 13.
 1863 *Patella levata* Deshayes, Cat. Moll. Réunion, p. 44, pl. 6, fig. 14.

Records—"South Seas" (type); MAURITIUS: (AWBP coll.); Vacoas Point, 3 miles south of Mahébourg (Ruth Ostheimer and Virginia Orr, Nov. 20, 1960). SEYCHELLES: (AWBP coll.); Mahé (AWBP coll.); Frigate Island (AWBP coll.). REUNION: (Deshayes, 1863).

Types—The type series of *pica* is in the British Museum (Natural History) and consists of three syntypes mounted upon a tablet. The one measuring 49.5 x 38 x 14 mm. is here nominated lectotype.

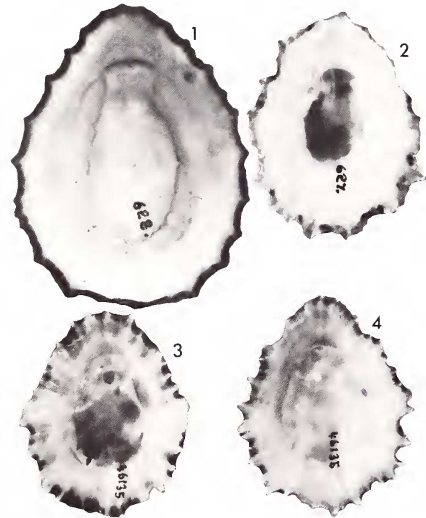


Plate 98. Fig. 1. *Patella (Scutellastra) exusta* Reeve, 1854. Mauritius, 48 mm., AWBP coll. 628. Figs. 2-4 *Patella (Scutellastra) exusta* subspecies *pica* Reeve, 1854. Fig. 2. Mauritius, 38 mm., AWBP coll. 627. Figs. 3, 4. Mahé, Seychelles, 42-45 mm., AWBP coll. 46135.

Patella flexuosa Quoy and Gaimard, 1834

(Pl. 65, figs. 8, 9; Pls. 99, 104)

Range—Andaman Islands and the tropical Pacific as far east as the Tuamotu Islands.

Remarks—This exceedingly variable species has had many names, and unfortunately the one under which it has usually appeared, *stellaeformis* Reeve, 1842, must fall as a synonym of the earlier *flexuosa* Quoy and Gaimard, 1834.

The species is intertidal and a shallow-water dweller, living attached to coral rock, or sometimes upon the outer and inner surfaces of large shells. Examples living attached to shells tend to be of lighter build, and of more circular outline

than those from coral-rock faces, but that is not invariably so, and all manner of shapes, sculpture and coloration is encountered, irrespective of station.

The species varies between 14 mm. and 41 mm., is circular to elongate-ovate in shape, may be almost flat to moderately elevated, thin or solid. The strength of the external ribbing determines the degree to which the margin is scalloped. The exterior is dull-white, sometimes sparingly speckled, lined, or with zigzag dark-brown markings in the rib interstices, but the outer surface is usually lime-encrusted. The interior is porcellanous, more or less white, and the spatula

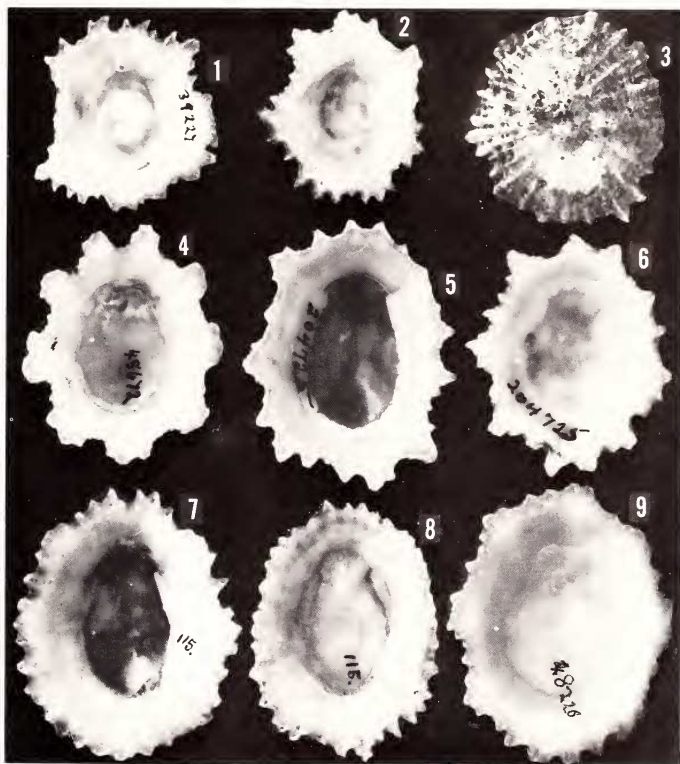


Plate 99. Figs. 1-9. *Patella (Scutellastra) flexuosa* Quoy & Gaimard, 1834. Fig. 1. Bouy Island, Aorei Islands, West New Guinea (*stellaeformis* form), 30 mm., AWBP coll. 39227. Figs. 2, 3. Micaechnas Cay, off Cairns, North Queensland, 29-34 mm. (topotypes of *inquisitor*), AWBP coll. 46062.

Fig. 4. New Caledonia, 31 mm. (topotype of *intraurea*), AWBP coll. 45672. Figs. 5, 6. Wake Island, 31-34 mm., AWBP coll. 204725. Figs. 7, 8. Paea, Tahiti, Society Islands, 33-35 mm. (*tuamotensis* form), AWBP coll. 115. Fig. 9. Bikini Island, Marshall Islands, 35 mm., AWBP coll. 48226.

may be white, yellowish, orange-brown, or sometimes dark-slate.

Description—Shell rather small, up to 42 mm. (1½ inches) in length, typically roundly-octagonal, with the apex nearly central, sculptured with 8 or 9 rounded radial folds that project strongly at the margin. The entire surface, folds and interstices alike, is densely sculptured with secondary, crisp, scabrous to spinose cords. In some forms the primary and secondary radials become nearly equal, in which cases the octagonal outline is modified to a crenulated oval. Colour as described under remarks.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3, very similar to that of *exusta pica* and *kermadecensis*. Prashad and Rao figured the radula of their 'tara,' which compares closely with the radula of a Cook Islands specimen. Prashad and Rao considered their species to be related to the South African *granularis*, but in that species the cusps are better formed, parrot-beaklike, and the shell is quite unlike the *flexuosa* group in form, size, texture and coloration.

Measurements (mm.)—

length	width	height	
41.0	35.0	17.5	Fakarawa, Tuamotus
39.0	30.0	9.5	Tokorava, Tuamotus
33.0	30.0	8.0	Michaelmas Cay (type of <i>inquisitor</i>)
30.0	28.0	9.0	Aoeri Ids., W. New Guinea
22.5	—	—	Vanikoro Id. (type of <i>flexuosa</i>), 10 lines.
16.0	15.0	11.0	Michaelmas Cay (type of <i>arrecta</i>)
14.0	12.0	3.5	Andaman Islands (type of <i>tara</i>)

Synonymy—

- 1834 *Patella flexuosa* Quoy & Gaimard, Voy. Astrolabe, Zool., vol. 3, p. 344, pl. 70, figs. 9-11.
 1842 *Patella stellaformis* Reeve, Conch. Syst., vol. 2, p. 15, pl. 136, fig. 3.
 1846 *Patella paumotensis* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 150.
 1854 *Patella pentagona* Born, Reeve, Conch. Iconica, pl. 20, figs. 48a-c.
 1854 *Patella cretacea* Reeve, Conch. Iconica, pl. 21, figs. 53a, b.
 1891 *Patella stellaformis* Reeve, Pilsbry, Man. Conch., vol. 13, p. 98, pl. 17, figs. 25-27; pl. 61, figs. 62-65.
 1891 *Helcioniscus flexuosus* Q. and G., Pilsbry, Man. Conch., vol. 13, p. 130, pl. 66, figs. 96-98.
 1929 *Pencapetella inquisitor* Iredale, Mem. Queensl. Mus., vol. 9, pt. 3, p. 276, pl. 31, figs. 17, 18.
 1929 *Pencapetella arrecta* Iredale, Mem. Queensl. Mus., vol. 9, pt. 3, p. 276, pl. 31, figs. 21, 22.
 1929 *Pencapetella intraurea* Iredale, Mem. Queensl. Mus., vol. 9, pt. 3, p. 276.
 1933 *Patella (Scutellastra) stellaformis tuamotensis* Dautzenberg & Bouge, Journ. Conchyl., vol. 77, p. 417; emendation pro *paumotensis* Gould, 1846.
 1934 *Patella (Patellidea) tara* Prashad & Rao, Rec. Indian Mus., vol. 36 (1), p. 1, pl. 1, figs. 1a-c, 2.

Types—The type of *flexuosa* should be in the Museum National d' Histoire Naturelle, Paris; three syntypes of *cretacea* are in the British Museum (Natural History); two syntypes of *paumotensis* are in the United States National Museum; the holotypes of *inquisitor*, *arrecta* and *intraurea* are in the Australian Museum, Sydney, and the holotype of *tara* is in the Indian Museum, Calcutta.

Records—ANDAMAN ISLANDS: S. Corbyn's Cove, Port Blair, on *Trochus niloticus* Linn. (Prashad & Rao). INDONESIA: Keledjitan, Bantam, Java (USNM). WEST NEW GUINEA: reef off Rouw Island, Aoeri Islands (ANSP. Exped., 24 Feb.

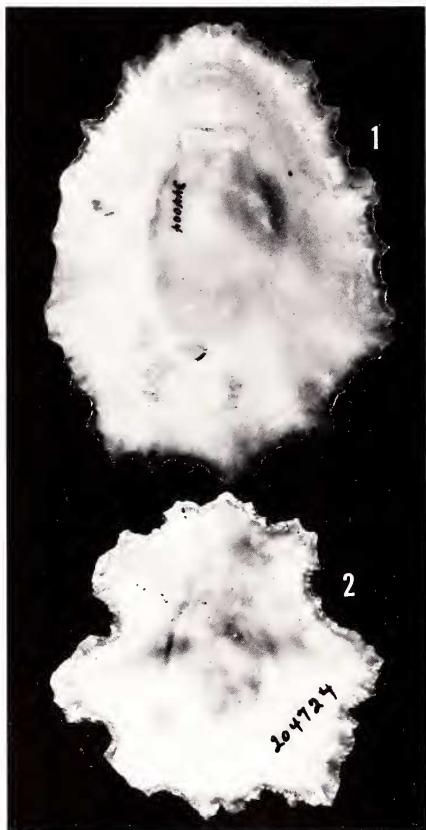


Plate 100. Figs. 1, 2. *Patella (Scutellastra) flexuosa* sub-species *optima* Pilsbry, 1927, Fig. 1, Ostuni, Japan, 93.5 mm., AWBP coll. 344004, Fig. 2, Waki, Satsuma, Japan, 48 mm., AWBP coll. 204724.

1956; AWBP coll.); Pai Island, Mios Woendi, Padaido Islands (ANSP). PHILIPPINES: Talin Bay, Batangas, Luzon (ANSP); Iba, Zambales, Luzon (ANSP). PALAU ISLANDS: Eil Malk Island (ANSP). MARIANAS: Guam, Saupon Point (AWBP coll.); Port Merizo (ANSP); Lagunan Tanapag, Saipan (ANSP). WAKE ISLAND: (ANSP); (AWBP coll.). LINE ISLANDS: Palmyra Island (USNM); (Bishop Mus.); (AWBP coll.); Washington Island (Bishop Mus.); Christmas Island (Bishop Mus.); Jarvis Island (ANSP). MARSHALLS: Enyu Island, Bikini (USNM); N.W. end Bikini Island (USNM); Kabelle Island, Rongelap (USNM); Wotho Island (USNM). SOLOMON ISLANDS: Bunana (AWBP coll.); Malaita Island (AWBP coll.). SANTA CRUZ ISLANDS: Vanikoro (type of *flexuosa*). NEW HEBRIDES: Pango Point, S.W. Efate, intertidal, on coral (W. O. Cernohorsky, 3-9-1970). N. W. AUSTRALIA: near Broome (Aust. Mus.). NORTH QUEENSLAND: Piper Island (Aust. Mus.); Masthead Reef (Aust. Mus. C. 18967); Michaelmas Cay, off Cairns, on or inside of *Tridacna* shells (types of *inquisitor* and *arrecta*; Aust. Mus.). NEW CALEDONIA (type of *intraurea*; Aust. Mus.); (AWBP coll.). LOYALTY ISLAND; (AWBP coll.); Lifu Island (USNM). FIJI ISLANDS: fringe reef, Korolevu, Viti Levu Island (ANSP). TONGA ISLANDS: (AWBP coll.). SAMOA: Pango Harbor (Aust. Mus.); Niuafoou Island (USNM); Ofu Island (ANSP); (AWBP coll.). COOK ISLANDS: Rarotonga (AWBP coll.); outer reef, near Muri, Rarotonga (L. Price, 1965). AUSTRAL ISLANDS: Rurutu Island (ANSP). SOCIETY ISLANDS: Tahiti (type of *cretacea*); Paea (AWBP coll.); Atine District, Punaania, seaward edge of reef (R. Robertson, 1952; ANSP); S. W. of Tautira Village (ANSP). TUAMOTU ARCHIPELAGO: Fakarava Island (USNM); (AWBP coll.); Tokorava Island (AWBP coll.); Raroia Island (ANSP); Makatea Island (USNM).

Patella flexuosa
subspecies *optima* Pilsbry, 1927

(Pl. 65, fig. 10; pl. 100)

Range—Japan, Amami Islands and Ryukyu Islands.

Remarks—This shell, here considered to be a

temperate subspecies of the tropical *flexuosa*, is extremely depressed, especially in its juvenile form, and at all stages of growth the prominent marginal lobes are a characteristic. Also, it attains a very much larger adult size than any other form of *flexuosa*.

Description—Shell large, up to 93.4 mm. (3½ inches) in length, solid, very depressed, elongate-ovate, gradually narrowed in front, apex varying between subcentral and the anterior third. Sculpture consisting of from 9 to 11 broad radial folds, that give a prominently lobed outline to the margin. The whole surface is crowded with narrow rounded radials that are rendered scabrous by concentric growth lines. Colour of exterior greyish to pale orange, with maroon to dark purplish-brown stripes in the interspaces of the radial folds. Interior porcellanous-white, the spatula clouded here and there with cinnamon-brown. Margin of shell with a narrow, semitransparent amber-coloured border, showing brownish maculations corresponding to the external pattern.

Measurements (mm.)—

length	width	height	
93.5	70.0	16.0	Osumi, Japan
92.0	72.0	16.0	Kakushima, Japan
84.0	60.0	15.0	holotype
56.0	41.5	8.0	Waki, Japan
40.0	32.5	5.0	Waki, Japan

Synonymy—

1927 *Patella staelaeformis optima* Pilsbry, The Nautilus, vol. 40, no. 4, p. 138, not figured.

1964 *Peneypatella optima* Fiblby, Habe, Shells of Western Pacific in colour, vol. 2, p. 7, pl. 3, fig. 1.

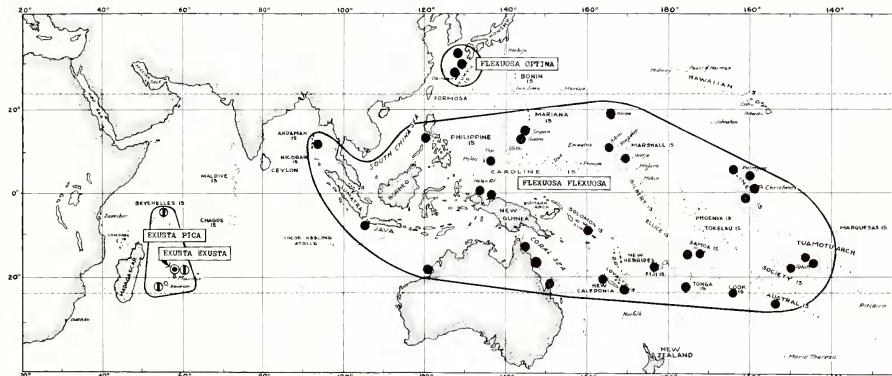


Plate 101. Geographical distribution of *Patella (Scutellastra) exusta* Reeve, *Patella (Scutellastra) exusta* subspecies *pica*

Reeve, *Patella (Scutellastra) flexuosa* Quoy & Gaimard, and *Patella (Scutellastra) flexuosa* subspecies *optima* Pilsbry.

Records—JAPAN: Yakushima, Osumi (type); Suwanosejima, Osumi (AWBP coll.); Waki, Kyushu Island (AWBP coll.). Amami and Ryukyu Islands (Habe, 1964).

Types—The holotype is in the Academy of Natural Sciences of Philadelphia. No. 98023.

***Patella kermadecensis* Pilsbry, 1894**

(Pl. 66, fig. 1; Pls. 102-104)

Range—Kermadec Islands

Remarks—This species is restricted to the Kermadec group, and is the second largest known living member of the Patellidae, sometimes attaining a length of seven inches, and exceeded in size only by the tropical West American *Patella* (*Ancistromesius*) *mexicana*.

The white porcellanous interior, and orange border of the shell, as well as its broadly ovate shape, readily distinguish *kermadecensis*.

Description—Shell very large and massive, up to 174 mm. (6½ inches) in length, broadly ovate, but slightly narrowed in front, apex almost central, and dorsal slopes almost straight. Sculpture consisting of a dense coverage of narrow radial ribs, all rendered weakly scabrous by concentric growth lines. The primary radials number from 35 to 50, and the secondary ones, which are almost as strong, number from 3 to 5 for each interspace. The margin is broadly and shallowly scalloped, corresponding to the interspaces of the primary radials. Colour of exterior dull-orange; interior porcellanous-white, with a narrow margin, that varies from pale to bright orange, and very occasionally is dark greenish-brown. The muscle impression is mostly dull cream, but occasionally it is greenish. Young shells have the

spatula fawn to pale orange-brown, and the orange border to the shell, varying from plain orange or radially streaked to almost continuously blotched with brown. The greenish muscle impression is present only in shells that have been thinned by external erosion.

Radula—Formula $3 + 1 + (2+1+2) + 1 + 3$. Radula very short and folded back upon itself at the end, as in typical *Patella*. There are five central teeth in a horizontal row, the median one shorter, narrower, and much smaller than the other four; all five bear blunt chisel-shaped cusps. The lateral is massive, with a broad head, bearing three fused chisel-shaped cusps. The three semitransparent marginals are small, elongated and narrow, each with a small blunt cusp.

Animal—As in *Patella vulgata*, the gill cordon is continuous, not interrupted by the head as in *Cellana*, and the cephalic tentacles are short and broadly conical, with the eye in a pit at the outer base.

Measurements (mm.)—

length	width	height	
174.0	160.0	—	Oliver, 1915, p. 510
153.0	137.0	51.0	Raoul Island
148.5	135.0	50.0	Raoul Island
136.0	117.0	42.0	Raoul Island
123.5	108.0	30.5	Raoul Island

Synonymy—

- 1894 *Patella* (*Scutellastra*) *kermadecensis* Pilsbry, The Nautilus, vol. 7, p. 109.
 1894 *Patella kermadecensis* Pilsbry, Taylor, The Nautilus, vol. 7, p. 142.
 1894 *Patella pilsbryi* Brazier, Proc. Linn. Soc. N. S. W., vol. 9, ser. 2, p. 183 (disputed locality, substituted South Africa, and renamed species).



Plate 102 *Patella* (*Scutellastra*) *kermadecensis* Pilsbry, 1894.

Raoul Island, Kermadec Islands, 123.5 mm., AWBP coll. 207.

1894 *Patella kermadecensis* Pilsbry, Proc. Acad. Nat. Sci. Phila., pp. 208-212, pls. 7, 8 (Kermadec locality confirmed).

1895 *Patella (Scutellastra) kermadecensis* Pilsbry, Cheeseman, Proc. Linn. Soc. N. S. W., vol. 10, ser. 2, pp. 221-223 (Kermadec locality confirmed).

1902 *Patella kermadecensis* Pilsbry, Suter, Journ. Malac., vol. 9, p. 111, pl. 8 (animal and dentition).

1915 *Scutellastra kermadecensis* Pilsbry, Oliver, Trans. N. Z. Inst., vol. 47, p. 510.

Types—The type specimens are in the Academy of Natural Sciences of Philadelphia.

Records—KERMADEC ISLANDS: Raoul (Sunday Island) (type); Raoul, Macaulay, and Curtis Islands, also French Rock (Oliver, 1915); Raoul Island (Auck. Mus.); (AWBP coll.); north and east coasts of Raoul Island, also Meyer Islet (Cheeseman, 1895).

Patella aurorae Fleming, 1973

(Pl. 105)

Range—New Zealand; Mason River, north of Waiatu, North Canterbury, in a boulder derived from the Isolated Hill Limestone of Duntroonian Oligocene age.

Remarks—This large and massive New Zealand fossil limpet is an obvious forerunner of the Recent *kermadecensis*, now confined to the Kermadecs, which in turn is related to the Melanesian *tucupiana*. These isolated occurrences, both in time and in location, suggest that this group of limpets once had a considerable geographical range.

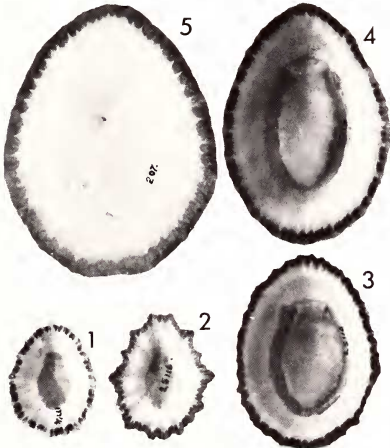


Plate 103, Figs. 1-5. *Patella (Scutellastra) kermadecensis* Pilsbry, 1894, Raoul Island, Kermadec Islands. Young stages in ascending order of size, from Fig. 1, length 30 mm. to Fig. 5, length 67 mm. Figs. 2 and 5 have a plain orange border. Figs. 1, 3 and 4 have the orange border streaked with dark-brown. Figs. 3 and 4 are elevated, but Fig. 5 is very depressed. AWBP coll. 207, 17764 and 25116.

The Oligocene fossil, compared with the Recent *kermadecensis* is less noticeably narrowed in front, has the apex nearer to the anterior margin, and the sculpture is very much stronger.

These differences are here considered to warrant full specific, rather than subspecific status for *aurorae*.

Description—Shell very large and massive, up to 200 mm. (8 inches) in length, broadly ovate and moderately elevated, height a little less than one third that of the length. Sculpture coarse, consisting of about 32 strong primary radials and 4-6 secondary radials in each interspace. Apex about two fifths the length, from the anterior end, which is only slightly narrowed.

Measurements (mm.)—

length	width	height	
180	150	75	holotype
200	—	—	paratype

Types—Holotype and paratype in the collection of the New Zealand Geological Survey, Lower Hutt, Wellington.

Synonymy—

1973 *Patella (Scutellastra) kermadecensis aurorae* Fleming, N.Z. Journ. Mar. & Freshw. Res. vol. 7 (1 & 2), p. 160.

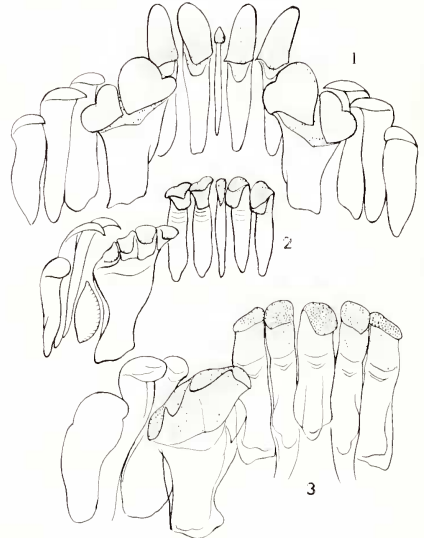


Plate 104, Fig. 11. *Patella (Scutellastra) kermadecensis* Pilsbry, Raoul Island, Kermadec Islands. Radula. Fig. 2. *Patella (Scutellastra) flexuosa* Quoy & Gaimard, Rarotonga, Cook Islands. Radula. Fig. 3. *Patella (Scutellastra) exusta* sub-species *pica* Reeve, Mauritius. Radula.

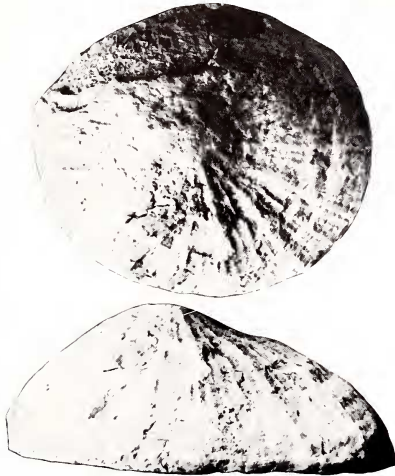


Plate 105. *Patella (Scutellastra) aurorae* Fleming, 1973. Mason River, North Canterbury, New Zealand. Duntroonian Pliocene.

***Patella tucopiana* (Powell, 1925)**

(Pl. 106)

Range—Tikopia (Tucopia) Island, Melanesia.

Remarks—A large solid limpet, but evidently of smaller adult size than *kermadecensis*, from which it differs in shape, being regularly ovate, not narrowed anteriorly, and also in the coloration of the exterior, which is black instead of orange. The writer knows of only the two type specimens of this rare species. They were obtained from a native of Tikopia who stated that they came from a nearby reef.

Description—Shell large, up to 92 mm. (3½ inches) in length, solid, ovate, depressed, the apex at about the anterior third, anterior slope almost straight, posterior slope convex, margin weakly crenulated. Sculpture consisting of numerous low narrow irregular radial ribs, 10 of them primary, and between 80 and 85 secondary radials. Colour of exterior dull black, more deeply impregnated in the rib interstices; interior creamy-white, with the spatula tinged pale flesh-colour; margin with a narrow amber coloured border, through which the external colour shows as a continuous series of irregular black dashes.

Measurements (mm.)—

length	width	height	
92.0	73.0	25.0	holotype
81.0	63.0	22.0	paratype

Synonymy—

1925 *Scutellastra tucopiana* Powell, Proc. Malac. Soc., London, vol. 16, pt. 4, p. 169.

Types—The holotype and paratype are in the Powell collection, Auckland. Known only from the type locality.

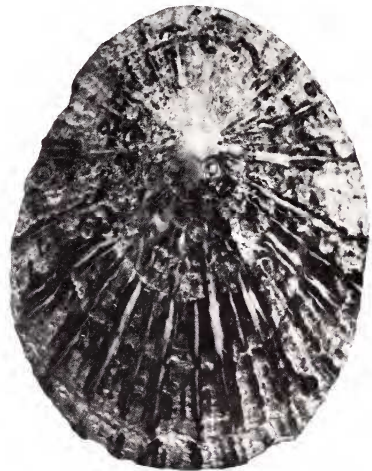


Plate 106. *Patella (Scutellastra) tucopiana* (Powell, 1925). Tikopia Island, Melanesia. Holotype (above), 92 mm., and paratype, 81 mm., AWBP coll. 206.

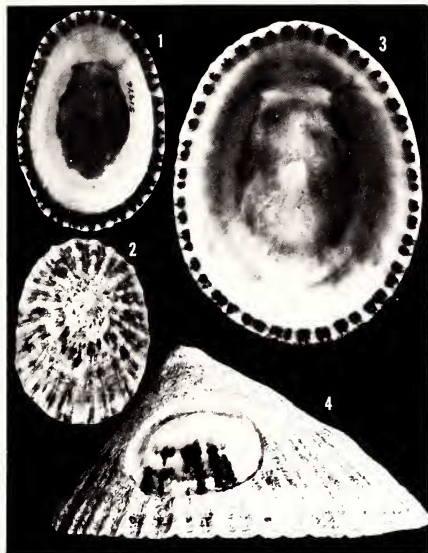


Plate 107. Figs. 1-4. *Patella (Scutellastra) laticostata* Blainville, 1825. Figs. 1, 2 Yellengap, Western Australia, 46-50 mm., AWBP coll. 51976. Figs. 3, 4. Cape Naturaliste, Western Australia, 81.5 mm., AWBP coll. 29117.

Patella laticostata Blainville, 1825

(Pl. 66, figs. 3, 4; Pls. 107 and 113)

Range—Western South Australia to southern Western Australia; lower littoral zone.

Remarks—This is the largest member of the subgenus *Scutellastra* found in Australian waters.

It is easily recognised by its solidity, large size, often over four inches in length, narrowly-ovate shape and high-conical profile. The interior is creamy-white, varyingly stained with orange-brown, and there is a marginal border of dark-brown maculations. The exterior is nearly always eroded, but in fresh non-eroded examples there is a coarse radial sculpture of dark-brown ribs.

Description—Shell very large, up to 110 mm. (4½ inches) in length, very solid, narrowly-ovate, and frequently high in profile, the apex at about the anterior third. Radial ribbing coarse and irregular in size; juveniles with about 22 primary ribs, increasing by interpolation to about 50 primaries in the adult, and there are finer subsidiary radials in the interstices. Interior porcellanous, with the crenulated border variably maculated, and with a well-defined, very large spatula, mainly white, or diffused with yellowish brown, but often surrounded at its outer edge by an irregular zone of deep orange-brown. The margin is rather wide in young shells but relatively narrow in the fully adult, and bears numerous radiate lines or thick dashes, in dark-brown, on a whitish ground. Externally the shell is usually eroded to a dull greenish grey, and sometimes bears one or two specimens of the acmaeid, *Patelloida nigrosulcata* (Reeve), which deeply excavate the surface.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. There are five central teeth, the middle one as long as, but narrower than, the other four, each with a single well-developed shovel-shaped cusp; the large palmate lateral bears four blunt cusps, and each of the three, slender, rod-like marginals has a blunt poorly developed cusp (see Macpherson, 1955, p. 235).

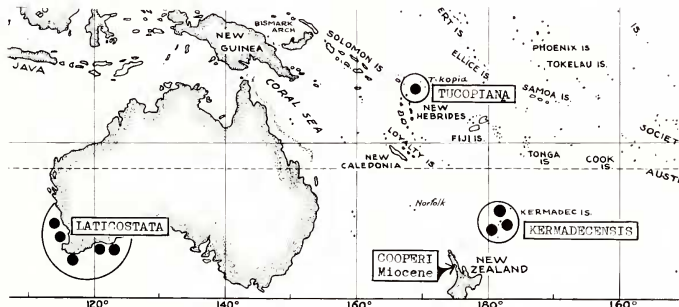


Plate 108. Geographical distribution of *Patella (Scutellastra) laticostata* Blainville, *Patella (Scutellastra) kermadecensis* Pilsbry, *Patella (Scutellastra) tucoptana* (Powell), and the

New Zealand Miocene *Patella (Scutellastra) cooperi* (Powell). These are all large species, comparable in size with the largest of the South African members.

Measurements (mm.)—

length	width	height	
110.0	85.0	54.0	all Charley Island.
92.0	68.0	35.0	Archipelago of the
83.0	60.0	56.0	Recherche
77.0	53.5	29.0	

Synonymy—

- 1825 *Patella laticostata* Blainville, Dict. Sci. Nat., vol. 38, p. 111.
 1826 *Patella neglecta* Gray, King's Intertropical Survey Aust., vol. 2, pp. 156, 182, 492.
 1843 *Patella rustica* Menke, Moll. New Holl., p. 33.
 1854 *Patella zebra* Reeve, Conch. Iconica, vol. 8, pl. 4, figs. 7a, b. Swan River. (non Blainville)
 1891 *Patella (Scutellastra) neglecta* Gray, Pilsbry, Man. Conch., vol. 13, p. 95, pl. 20, fig. 41.
 1924 *Patella laticostata* Blainville, Iredale, Proc. Linn. Soc. N.S.W., vol. 49, p. 241.
 1955 *Patellanax laticostata* Blainville, Macpherson, Proc. Roy. Soc. Vict., vol. 67 (2), p. 234, text figs., pl. 8, fig. 4.
 1959 *Cellana laticostata* Blainville, Cotton, S. Aust. Moll., Archaeogast., Govt. Print., Adelaide, p. 292.

Records—Western SOUTH AUSTRALIA: Port Lincoln and Streaky Bay (B. C. Cotton, 1959). South WESTERN AUSTRALIA: King George Sound (B. C. Cotton, 1959); Charley Island, Archipelago of the Recherche; Quarantine Ground, Albany; Foul Bay; Cape Naturaliste; Garden Island, Fremantle (all AWBP coll.). A record from Shark Bay, North Western Australia (B. C. Cotton, 1959) requires confirmation.

Patella peronii Blainville, 1825

(Pl. 65, figs. 11-13; Pls. 109 and 113)

Range—Australia; from southern Western Australia to Victoria, Tasmania and New South Wales.

Remarks—This species, also, is extremely variable in shape and in sculptural development, ranging from typical *peronii*, which is weakly but regularly smooth ribbed, thus producing an almost smooth margin, to the strongly squamose sculptured *squamifera* form, in which the margin becomes noticeably corrugated. Dr. Hope Macpherson (1955) claimed that when large series were examined, both forms were seen to intergrade, and no differences in the radula were apparent. Common on exposed rock platforms of the lower littoral zone to the sublittoral fringe, among holdfasts of giant kelp.

Description—Shell of moderate size, averaging about 35 mm. but reaching 47 mm. (1½ to 1¾ inches) in length, solid, tall-conical, with the apex varying between subcentral and the anterior fourth. Sculpture extremely variable, ranging from low, rounded, primary radials with 4 to 6 radial threads in the interspaces (typical form), to

strongly sculptured shells with about 24 bold carinated and spinose primary radials, with a few relatively strong interstitial radials (*forma squamifera*). Colour, externally yellowish brown with the radials paler, interior porcellanous-white with a faint yellowish brown spatula. In the typical *peronii* form the secondary radial interspaces are often lined in black. Shell margin thin semitransparent, yellowish with the external interstitial lines showing through. The shell margin varies according to the strength of the external sculpture being almost smooth in the *peronii* form but strongly corrugated in the *squamifera* form.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. Central teeth five, the middle one much smaller than the other four, lateral with four cusps, followed by the usual three functionless marginals (Macpherson, 1955, p. 233).

Measurements (mm.)—(A) = typical *peronii*; (B) = *squamifera* form.

length	width	height	
47.0	39.0	24.0	Port Arthur, Tasmania; (A)
43.5	34.0	16.0	Port Jackson; (B)
37.4	29.5	15.0	New South Wales; (B)
31.5	25.0	12.5	Shellharbour, N.S.W.; (B)

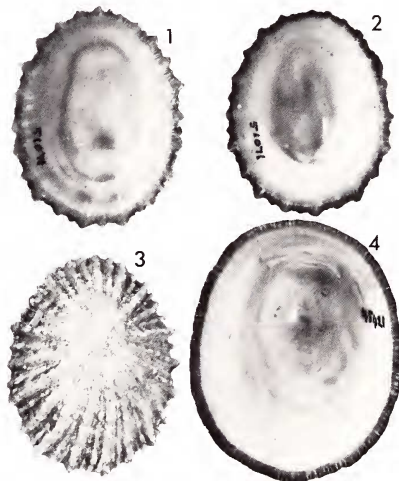


Plate 109. Figs. 1-4. *Patella (Scutellastra) peronii* Blainville, 1825. Figs. 1, 2. Merimbula, New South Wales, 39-42 mm., AWBP coll. 51071. Fig. 3. Port Jackson, New South Wales, 43 mm., AWBP coll. 212 (*squamifera* form). Fig. 4. Port Arthur, Tasmania, 47 mm., AWBP coll. 45421 (*peronii* = *ustulata* form).

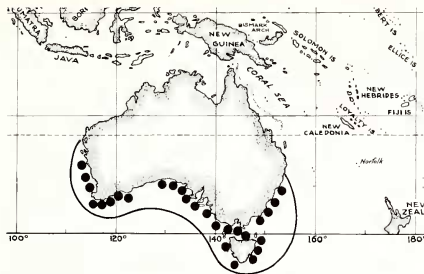


Plate 110. Geographical distribution of *Patella (Scutellastra) peronii* Blainville.

Synonymy—

- 1825 *Patella peronii* Blainville, Dict. Sci. Nat., vol. 38, p. 111.
 1848 *Patella diemenensis* Philippi, Zeitsch. f. Malak., vol. 5, p. 162.
 1855 *Patella ustulata* Reeve, Conch. Iconica, pl. 31, figs. 88a, b.
 1855 *Patella aculeata* Reeve, Conch. Iconica, pl. 32, fig. 90 (non Gemelin).
 1855 *Patella squamifera* Reeve, Conch. Iconica, pl. 32, fig. 94.
 1876 *Patella tasmanica* T-Woods, Proc. Roy. Soc. Tasman., p. 157.
 1891 *Patella (Scutellastra) ustulata* Reeve, Pilsbry, Man. Conch., vol. 13, p. 101, pl. 22, figs. 11, 12.
 1891 *Patella (Scutellastra) aculeata* Reeve, Pilsbry, Man. Conch., vol. 13, p. 100, pl. 25, figs. 20, 21; pl. 62, figs. 11, 12.
 1906 *Patella hepatica*, Verco, Trans. Roy. Soc. S. Aust., vol. 30, p. 207. Non P. and G.
 1924 *Patellanax squamifera* Reeve, Iredale, Proc. Linn. Soc. N. S. W., vol. 49, p. 239.
 1955 *Patellanax peronii* Blainville, Macpherson, Proc. Roy. Soc. Vict., vol. 67, pt. 2, pp. 232, 233, text figs. (shells and radula).
 1957 *Patellanax peronii* Blainville, Cotton, South Aust. Moll. Archaeogast., Govt. Print., Adelaide, p. 290, text fig. 194.

Records—Southern WESTERN AUSTRALIA: King George Sound (type locality). SOUTH AUSTRALIA: Marino, VICTORIA: near Port Phillip Heads. TASMANIA: Port Arthur; Blackman's Bay. NEW SOUTH WALES: Merimbula; Port Jackson; Cronjilla; Shellharbour (all AWBP coll.).

Patella chapmani Tenison-Woods, 1875

(Pl. 111; Pl. 113, fig. 3)

Range—Southern half of Australia and Tasmania.

Remarks—This is a small white limpet that assumes different outlines, varying from irregularly-lobed to a regular 8-pointed star. This latter form, more common in New South Wales is the "*Acmaea saccharina* var. *perplexa*" of Pilsbry, 1891. It lives in the lower littoral zone among algae on rock platforms and boulders.

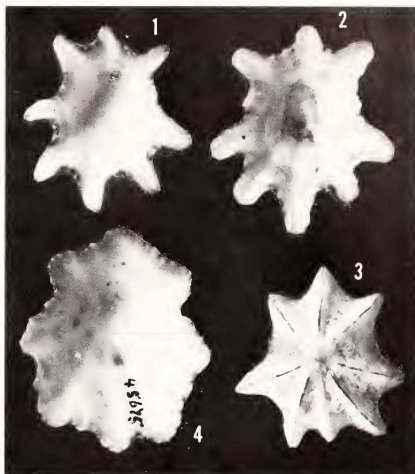


Plate 111. Figs. 1-4. *Patella (Scutellastra) chapmani* Tenison Woods, 1875. Figs. 1-3. Kurnell Botany Bay, New South Wales, 22.5-25 mm., AWBP coll. 19573. Fig. 4. North Harbour, Port Jackson, New South Wales, 31 mm., AWBP coll. 45675.

Description—Shell small, average length 20 mm. ($\frac{1}{2}$ of an inch) but grows up to 30 mm. (1 $\frac{1}{2}$ inches), irregularly to regularly star-shaped, with eight prominent radial ribs that project to a varying extent; irregularly and weakly lobate in typical *chapmani*, regularly and strongly projecting and narrowly-pointed in the form *perplexa*. Surface sculptured with numerous radial, weakly-scabrous lirae, the centre one down each of the eight radial folds being stronger than the rest. Colour of exterior buff, with scattered flecks of light-brown, and often, especially in the *perplexa* form, with a narrow reddish brown line down the crest of each of the eight radial folds. Interior porcellanous-white, without a clearly defined spatula.

Radula—Formula 3 + 1 + (2+1+2) + 1 + 3. Central teeth five, the middle one only half the size of the other four, lateral massive with four cusps, and the three marginals long and slender, each with a weak blunt cusp.

Measurements (mm.)—

length	width	height	
30.0	28.0	12.0	North Harbour, Sydney
28.5	27.0	6.0	Kurnell, N. S. W.
23.0	19.5	6.0	Kurnell, N. S. W.
18.5	16.0	4.0	Kurnell, N. S. W.

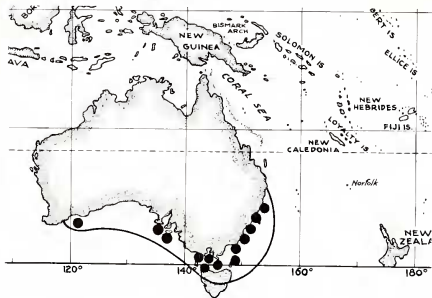


Plate 112. Geographical distribution of *Patella (Scutellastra) chapmani* Tenison-Woods.

Synonymy—

- 1873 *Patella octoradiata* Hutton, Cat. Mar. Moll. N. Z., p. 44 (erroneously attributed to New Zealand). (non Gmelin).
 1875 *Patella chapmani* Tenison-Woods, Proc. Roy. Soc. Tas., p. 157.
 1876 *Acmaea alba* Tenison-Woods, Proc. Roy. Soc. Tas., p. 155.
 1891 *Acmaea saccharina perplexa* Pilsbry, Man. Conch., vol. 13, p. 50, pl. 36, figs. 69, 71.
 1915 *Patelloida perplexa* Pilsbry, Iredale, Trans. N. Z. Inst., vol. 47, p. 430.
 1922 *Patella perplexa* Pilsbry, Peile, Proc. Malac. Soc., Lond., vol. 15, p. 16, text fig. 4.
 1924 *Patella perplexa* Pilsbry, Iredale, Proc. Linn. Soc. N. S. W., vol. 49, p. 238.
 1924 *Scutellastra chapmani* Tenison-Woods, Oliver, N. Z. J. Sci. Tech., vol. 7, p. 244 (radula).
 1955 *Patellanax chapmani* Tenison-Woods, Macpherson, Proc. Roy. Soc. Viet., vol. 67, pt. 2, p. 231, text figs.; pl. 8, figs. 1, 2.
 1959 *Patellanax alba* Tenison-Woods, Cotton, S. Aust. Moll., Archaeogast., Govt. Print., Adelaide, p. 288.

Types—The types of *chapmani* and of *alba* are in the Tasmanian Museum, Hobart, and that of *perplexa* in the Academy of Natural Sciences of Philadelphia.

Records—AUSTRALIA: NEW SOUTH WALES; Angourie, north coast; North Harbour, Port Jackson; Kurnell, Botany Bay; Shellharbour; TASMANIA (type locality of *chapmani*); (all AWBP coll.). SOUTH AUSTRALIA: VICTORIA and southern WESTERN AUSTRALIA (Cotton, 1959).

Patella hamiltonensis (Chapman and Gabriel, 1923)

Range—Muddy Creek, upper beds, Victoria, Australia, Kalimnan, lower Pliocene.

Remarks—This species, described as an acmaeid, and compared with "*Patelloida perplexa* Pilsbry" by its authors, was recently referred to *Patellanax* by Darragh, 1970. The present writer has not seen the type material but accepts Darragh's location

of the species in the Patellidae. The original description follows, but the original accompanying illustration is not clear enough for copying.

Description—"Shell solid, irregularly oval, strongly ribbed; apex sub-central, much eroded and probably originally smooth. The sculpture consisting of about ten rather prominent radiating ribs, the interspaces of which are occupied by finer riblets of varying strength. About three, irregular growth stages are discernible on the shell surface, which are marked by slight overlapping or sulcation. The area between the major ribs, depressed or fluted, resulting in an undulose margin to the shell. Colour pale ochre."

Observations—This species approaches *Patelloida perplexa* Pilsbry, but differs in the ribs being less pronounced and not salient at the margins." [*Acmaea saccharina* var. *perplexa* Pilsbry, 1891, is actually a synonym of *Patella (Scutellastra) chapmani* Tenison-Woods, 1875].

Measurements (mm.)—

length	width	height	
13.0	12.0	5.5	holotype

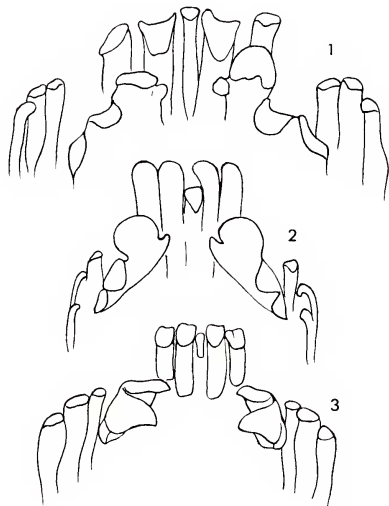


Plate 113. Fig. 1. *Patella (Scutellastra) laticostata* Blainville, southern Western Australia. Radula, from Macpherson, 1955, p. 235, text fig. Fig. 2. *Patella (Scutellastra) peronii* Blainville, Victoria. Radula, from Macpherson, 1955, p. 233, text fig. Fig. 3. *Patella (Scutellastra) chapmani* Tenison Woods (as *P. perplexa* Pilsbry), New South Wales. Radula, from Peile, 1922, Proc. Malac. Soc., vol. 15, p. 16, fig. 4.

Synonymy—

1923 *Patelloida hamiltonensis* Chapman & Gabriel, Proc. Roy. Soc. Victoria, vol. 36 (N. S.), pt. 1, p. 24, pl. 1, fig. 3.

1970 *Patellanax hamiltonensis*. Darragh, Mem. National Mus. Victoria, vol. 31, p. 173.

Types—The holotype and two paratypes are in the National Museum of Victoria, Melbourne, Australia.

Patella cooperi (Powell, 1938)

(Pl. 114)

Range—New Zealand, lower Miocene.

Remarks—The species belongs to the wide ranging Indo-Pacific *flexuosa* group, but just how closely related is this Miocene species, cannot be determined on the basis of the only known examples, both of which are in an eroded and badly damaged condition.

Description—Shell of moderate size, 50 mm. (2 inches) or more in length, solid, depressed, elongated, star-shaped, with eight principal radial ribs that are carinated, very prominent, and strongly projecting at the margin. In the interstices there are from 3 to 5 secondary ribs. Apex estimated at about the anterior third.

Measurements (mm.)—

length	width	height	
50.0	38.0	9.0	(approximately); holotype

Synonymy—

1938 *Scutellastra cooperi* Powell, Trans. Royal Soc. N. Z., vol. 68, p. 379, pl. 39, figs. 13, 14.

Records—NEW ZEALAND: Motuhū Island, south coast, Auckland, in conglomerate, basal Waitenata Group, Otaian Stage, lower Miocene.

Types—Holotype and paratype in the Auckland Museum.

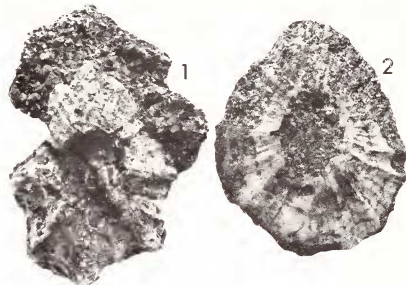


Plate 114. *Patella (Scutellastra) cooperi* (Powell, 1938), New Zealand, Motuhū Island, Auckland, Otaian, lower Miocene. Fig. 1. Holotype, 50 mm., Auck. Mus. 706. Fig. 2. Paratype, 69 mm., Auck. Mus.

[These occasional blank areas occur between genera and subgenera to permit the insertion of new material and future sections in their proper systematic sequence.]

Subgenus ANCISTROMESUS Dall, 1871

Type: *Patella mexicana* Broderip and Sowerby, 1829

This is the largest known patellid limpet which sometimes attains a length of 14 inches. It is the only known true patellid living on the west coast of the Americas, with the exception of the subantarctic *Nacella* and *Patinigera*, of which the latter extends up the Chilean coast as far north as Valparaiso.

Dall's subgenus is based largely upon the different form of the branchial lamellae, which are not semicircular as in other patellids, but are produced, twisted and elongated, having an arborescent appearance. Also, unique among patellids, the entire animal is black, more or less marbled and streaked with white.

The radula is similar to that of other Indo-Pacific *Patella* except that the median central tooth is fully developed so that there are five evenly-developed centrals in one horizontal series. In other Indo-Pacific *Patella* species the median central tooth is much smaller, vestigial, or occasionally absent, as it is in the European *Patella vulgata*.

Undoubtedly there is some relationship between *Ancistromesus* and large Indo-Pacific patellids, such as *keradecensis* Pilsbry and *tucopiana*

Powell. It is assumed that *Ancistromesus* owes its presence in the tropical West American fauna, as an extreme Indo-Pacific outlier, having reached there in the geological past when the ancient Tethys Sea offered a free equatorial water-way around the globe.

Synonymy—

1871 *Ancistromesus* Dall, American Journal of Conchology, vol. 6, part 3, p. 266. Type, by monotypy, *Patella mexicana* Broderip and Sowerby, 1829.

Patella mexicana Broderip and Sowerby, 1829

(Pl. 115)

Range—Gulf of California to Peru.

Remarks—Apart from its solidity and huge adult size, *mexicana* has a consistently narrowly ovate outline, and young shells are at once recognised by the presence of a broad, thin, semitransparent margin that extends out abruptly from the outer edge of the porcellanous interior.

It is almost certain that *Patella gigantea* Lesson, 1831, described from a shell "thrown on the coral rocks" at Borabora, Society Islands, is a *mexicana* that was probably taken there and discarded by a sailor from one of the many whalers that frequented the area at about the time. Apparently Lesson's shell has never been figured, and enquiries concerning the existence or not of the type specimen were abortive, since at the time of writing, the molluscan collections of the Museum National d' Histoire Naturelle, Paris, were under general reorganisation.

Dr. Harald A. Rehder of the National Museum

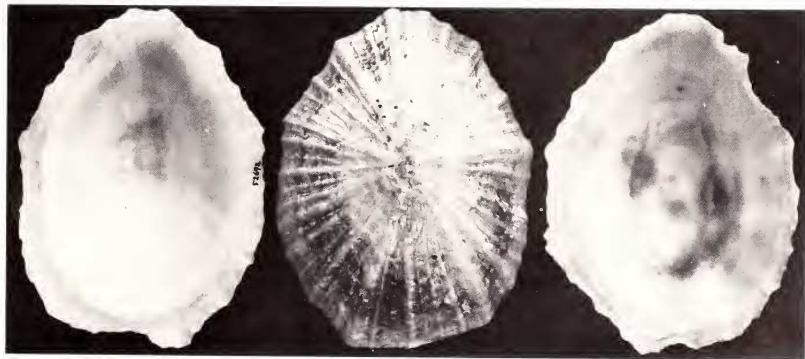


Plate 115. *Patella (Ancistromesus) mexicana* Broderip & Sowerby, 1829. Mazatlan, West Mexico. 107-116 mm. AWBP

coll. 52692. The world's largest limpet, known to attain a length of 355 mm. - 14 inches.

of Natural History, Washington, who has just spent six months of intensive collecting at Borabora and neighbouring areas, did not find any large limpets resembling *gigantea*, and he also is of the opinion that *gigantea* should be considered a synonym of *mexicana* (personal communication).

The dimensions given by Lesson for his *gigantea*, the equivalent of 7 by 5 inches, match exactly the length-width ratio of a series of *mexicana*. Also Lesson's description of the interior of his shell—"L' intérieur est lisse, blanchâtre, avec le fond rougeâtre", applies to occasional examples of *mexicana*, the reddish brown staining of the spatula area, occurring when the outer surface has been extensively eroded.

Description—Shell massive and very large, 200 to 355 mm. (8 to 14 inches) in length, depressed in its younger stages but moderately elevated in the adult, with the apex subcentral to a little nearer to the anterior end. Outline elongate-ovate, noticeably narrowed at the anterior end, the margin thin, wide, flattened and irregularly corrugated in juveniles, but thickened and minutely crenulated in the adult. Sculpture in young shells consisting of eleven low and broad primary radials and a varying number of secondary radials in between. Adult shells are almost invariably eroded, encrusted, or riddled by boring bivalves. Colour dull-white externally and porcellanous-white within, sometimes diffused with reddish brown over the spatula. In young shells the broad flat thin margin is semitransparent.

Measurements (mm.)—

length	width	height
355.0	—	— Keen, 1958, p. 242
185.0	148.0	ca 60.0 Caleta, Acapulco
158.0	114.0	67.0 Caleta, Acapulco
95.0	75.0	16.0 Acapulco

Synonymy—

- 1829 *Patella mexicana* Broderip and Sowerby, Zool. Journ., vol. 4, p. 369.
 1831 *Patella gigantea* Lesson, Voy. Coquille, Zool., vol. 2, p. 423.
 1841 *Patella maxima* Orbiguy, Moll. Amer. Mérid., p. 482.
 1855 *Patella mexicana* Brod. and Sby., Reeve, Conch. Iconica, pl. 1, fig. 1.
 1871 *Ancistromesus mexicanus* Brod. and Sby., Dall, Amer. Journ. Conch., vol. 6, pt. 3.
 1891 *Patella gigantea* Lesson, Pilsbry, Man. Conch., vol. 13, p. 156.
 1891 *Patella mexicana* Brod. and Sby., Pilsbry, Man. Conch., vol. 13, p. 108, pl. 31, figs. 59-62.
 1958 *Patella (Ancistromesus) mexicana* Brod. and Sby., Keen, Seashells Trop. W. America, p. 242.

***Patella fuezalidai* Herm, 1969**

(Pl. 116)

Range—Pliocene of northern Caldera Province, Atacama, North Chile.

Remarks—This species differs from the Recent *mexicana* in being more broadly ovate, much finer sculptured, with the primary radials almost obsolete, and in having a much narrower margining bevel.

Description—Shell massive and very large, 188-209 mm. (7½-8¼ inches) in length, broadly ovate, only slightly narrowed towards the anterior end, and rather elevated. Sculpture very densely and finely radially lirate, and obsoletely eight-rayed, the rays visible only by the flattened planes between them. Apex a little anterior to the middle. Interior with a large well defined spatula, and a relatively narrow bevelled margin at the perimeter of the shell.

Measurements (mm.)—

length	width	height	
209.0	187.0	68.0	holotype
188.0	161.0	61.0	paratype

Synonymy—

- 1969 *Patella (Ancistromesus) fuezalidai* Herm, Zitteliana, vol. 2, p. 131, pl. 14, figs. 1-3.

Types—The location of the type is unknown to us.

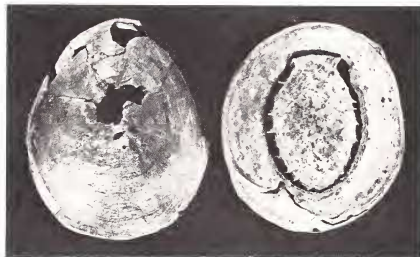


Plate 116. *Patella (Ancistromesus) fuezalidai* Herm, 1969. South America, northern Caldera Province, Atacama, North Chile, Pliocene. Holotype, 209 mm., and paratype, 188 mm., from Herm, 1969, Zitteliana, 2, pl. 14, figs. 1, 2.

Genus *Helcion* Montfort, 1810Type: *Helcion pectunculus* (Gmelin, 1791)

This genus has a radula identical with that of *Patella*, but the gill cordon, unlike that of *Patella*, is interrupted in front by the head as it is in *Cellana*. The radula in *Cellana* differs from that of both the above genera in consisting of a pair of central teeth followed by a pair of laterals. The shell of typical *Helcion* is cap-shaped, high-arched, with the incurved apex almost at the anterior end. The sculpture consists of radial scaly ribs.

Synonymy—

1810 *Helcion* Montfort, *Conchyliologie Systématique et Classification Méthodique des Coquilles*, vol. 2, pp. 62, 63. Type, by monotypy: *Helcion pectinatus* Montfort, 1810, which is *Patella pectunculus* Gmelin, 1791.

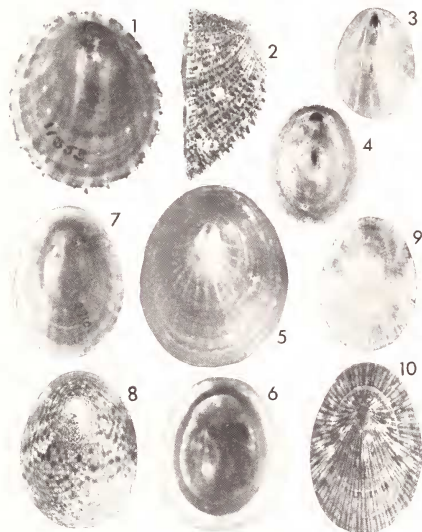


Plate 117. Figs. 1, 2. *Helcion pectunculus* (Gmelin, 1791), Port Elizabeth, South Africa, 28 mm., AWBP coll. 11853. Figs. 3-6. *Helcion (Ansates) pellucidus* (Linnaeus, 1758). Figs. 3, 4. South coast, England, 14 mm., Auck. Mus. 19409. Figs. 5, 6. (*laevis* form), 20-24 mm., south coast England, AWBP coll. 52497. Figs. 7, 8. *Helcion (Patinastrea) pruinosis* (Krauss, 1848), Algoa Bay, South Africa, 23-25 mm., AWBP coll. 2910. Figs. 9, 10. *Helcion (Patinastrea) dunkeri* (Krauss, 1848), Port Alfred, South Africa, 15-20 mm., AWBP coll. 52495.

Helcion pectunculus (Gmelin, 1791)

(Pl. 117, figs. 1, 2; Pl. 118, fig. 1)

Range—South Africa.

Remarks—This is a common intertidal species.

Description—Shell rather small, up to 28 mm. (over 1 inch) in length, solid, roundly ovate, high arched, with the apex incurved and almost at the anterior end. Sculptured with numerous scaly to spinose ribs, both primary and secondary. Colour buff to light brownish with the ribs black; interior varying from dull leaden to orange-brown. Often the black radials are interrupted, resulting in a tessellated pattern.

Measurements (mm.)—

length	width	height	
28.0	24.0	13.0	Port Elizabeth
23.5	19.5	9.0	Port Elizabeth

Synonymy—

1778 *Patella pectinata* Linn., *Born, Index Rerum Natur. Mus. Caes. Vind.*, p. 441.

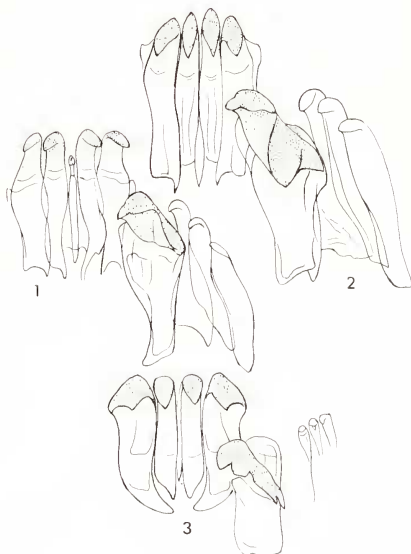


Plate 118. Fig. 1. *Helcion pectunculus* (Gmelin), "Red Sea", in error - South Africa. Radula, from Thiele, 1891, pl. 28, fig. 23. Fig. 2. *Helcion (Patinastrea) pruinosis* (Krauss), Cape of Good Hope. Radula, from Thiele, 1891, pl. 28, fig. 24. Fig. 3. *Helcion (Ansates) pellucidus* (Linnaeus), Helgoland. Radula, from Thiele, 1891, pl. 28, fig. 26.

- 1780 *Patella pectinata* Born, Test. Mus. Caes. Vind., p. 423, pl. 18, fig. 7. (non Linnaeus, 1758).
 1791 *Patella pectunculus* Gmelin, Syst. Nat. ed. 13, p. 3713; based upon Martini-Chemnitz, Conch. Cab., vol. 1, pl. 7, figs. 56, 57.
 1810 *Helcion pectinatus* Montfort, Conchyl. Systém., vol. 2, p. 62.
 1848 *Patella pectinata* Linné, Krauss, Südafr. Moll., Stuttgart, p. 57.
 1891 *Patella (Helcion) pectinata* Linn. Pilsbry, Man. Conch., vol. 13, p. 109, pl. 51, figs. 1-3.
 1891 *Helcion pectunculus* Gmelin, Troschel and Thiele, Das Gebiss der Schnecken, vol. 2, pl. 28, fig. 23 (radula).
 1948 *Helcion pectunculus* Gmelin, Stephenson, Ann. Natal Mus., vol. 11, part 2, p. 278, text fig. 10 (radula).

Records—SOUTH AFRICA: Cape of Good Hope (AWBP coll.); Port Elizabeth (AWBP coll.); Port Natal (AWBP coll.); Gouritz River mouth, Cape Province (V. Orr, 1955; Auck. Mus.); Durban (Auck. Mus.).

margin, where the sculpture is more pronounced. Such shells are always ledged, the early portion being exactly like normal *pellucidus*. Pilsbry (1891) remarked that the *laevis* variety is due to station, such individuals being found partly embedded in the stems of *Fucus*.

Description—Shell small, up to 24 mm. (1 inch) in length, usually rather thin, ovate, high-arched, the apex immersed and situated towards the anterior end. Surface smooth and polished, with very weak radial riblets. Colour golden brown, black tipped at the apex, and usually with a few vivid sky-blue lines running back from the apex to the posterior margin.

Measurements (mm.)—

length	width	height	
24.0	20.3	10.0	England; <i>laevis</i> form
20.0	15.0	8.0	Pilsbry, 1891, p. 110
14.0	11.0	5.0	S. coast, England

Synonymy—

- 1758 *Patella pellucida* Linnaeus, Syst. Nat., ed. 10, p. 783.
 1777 *Patella laevis* Pennant, Brit. Zool., ed. 4, vol. 4, p. 125.
 1777 *Patella intorta* Pennant, Brit. Zool., ed. 4, vol. 4, p. 125.
 1778 *Patella coeruleata* da Costa, Brit. Conch., p. 7, pl. 1, figs. 5, 6.
 1779 *Patella cornea* Helbling, Abh. Privatges. Bohm., vol. 4, p. 107.
 1803 *Patella bimaculata* Montagu, Test. Brit., vol. 2, p. 482.
 1811 *Patella cypridium* Perry, Conchology, London, pl. 43, fig. 6.
 1813 *Patella elongata* Fleming, Brewster's Edinb. Encycl., vol. 7 (1), p. 65.
 1813 *Patella elliptica* Fleming, Brewster's Edinb. Encycl., vol. 7 (1), p. 65.
 1838 *Patella cornea* Potiez & Michaud, Gal. Moll. Douai, vol. 1, p. 525.
 1891 *Helcion (Patina) pellucida* L., Pilsbry, Man. Conch., vol. 13, p. 110, pl. 51, figs. 4-10.
 1891 *Patina pellucida* Linn., Thiele, in Troschel & Thiele, Das Gebiss der Schnecken, vol. 2, pl. 28, fig. 26 (radula).

Radula—Formula 3 + 1 + (4) + 1 + 3, very similar to the radula of *Patella* except that the two outer centrals are larger than the inner two; there is no trace of a median central.

? *Helcion tella* (Bergh, 1871)

Range—Sargasso Sea

Remarks—This species was described from the soft parts only, of a poorly preserved specimen, the shell of which had been detached and lost. Its author compared his species with the European *Helcion (Ansates) pellucidus* (Linnaeus).

Synonymy—

- 1871 *Patina tella* Bergh, Verhandl. der k.-k. zool. bot. Gesellsch. Wien, 21, p. 1297.
 1891 *Patina tella* Bergh, Pilsbry, Man. Conch., 13, pp. 111-112.

Subgenus ANSATES Sowerby, 1839

Type: Patella pellucida Linnaeus, 1758

This subgenus differs from typical *Helcion* in being almost smooth. The type species is a seaweed dweller, which accounts for its comparatively light build and weak sculpture.

Synonymy—

- 1839 *Ansates* Sowerby, Conchological Manual, p. 6. Type, by monotypy: *Patella pellucida* Linnaeus, 1758.
 1847 *Patina* Gray, Synopsis of Contents of British Museum ed. 42, p. 148 (non Rafinesque, 1815).

***Helcion pellucidus* (Linnaeus, 1758)**

(Pl. 117, figs. 3-6; Pl. 118, fig. 3)

Range—Seas of western Europe, from Lofoten Islands, Norway, to Portugal.

Remarks—The typical form of this attractive little cap-shaped shell is smooth, and of orange-brown colour, with a few sky-blue longitudinal lines. It lives on *Laminaria* and *Fucus* seaweeds, to a depth of about 15 fathoms. The variety *laevis* is a gerontic form of the species that is thicker, larger, and flattens out towards the

1931 *Patella pruinosa fuscocoriata* Turton, Mar. Shells Port Alfred, p. 171, pl. 40, fig. 1216.

1932 *Patella dunkeri approximata* Turton, Mar. Shells Port Alfred, p. 170, sp. 1210.

1948 *Helcion pruinosa* Krauss, Stephenson, Ann. Nat. Mus., vol. 11, pt. 2, p. 278, text fig. 10 (radula).

Records—SOUTH AFRICA: Cape of Good Hope (type locality); Cape Peninsula (AWBP coll.); Port Alfred (Turton, 1932).

Subgenus PATINASTRA Thiele in Troschel, 1891

Type: *Helcion (Patinastra) pruinosis* (Krauss, 1848)

Shell very similar to that of *Cellana*, being low and spreading with the apex varying between the anterior fourth and fifth, but the gill cordon is complete as in *Patella*. Radula similar to that of *Ansatres*, except for the marginals which are very large. Recent, South Africa.

Synonymy—

1891 *Patinastra* Thiele in Troschel, Das Gebiss der Schnecken, vol. 2, p. 325. Type, by monotypy: *Patella pruinosa* Krauss, 1848.

Helcion pruinosis (Krauss, 1848)

(Pl. 117, figs. 7, 8; Pl. 118, fig. 3)

Range—South Africa, generally distributed.

Remarks—A thin oval shell of low profile, yellowish-olive, variously rayed and speckled in dark green or brown, easily distinguished from the next species, *dunkeri*, by its almost smooth surface and radial series of sky-blue spots.

Description—Shell rather small, up to 31 mm. (1¼ inches) in length, but usually about 23 mm. (¾ of an inch), rather thin, elongate ovate, narrowed anteriorly, rather depressed, and with the apex at about the anterior fifth. Sculpture weak, consisting of very numerous narrow radial thread crossed by dense, much finer, concentric lirae. Colour of exterior yellowish olive sparingly dark-brown speckled and with most of the radials minutely dotted with sky-blue. Interior yellowish olive, shining, without a clearly defined spatula.

Measurements (mm.)—

length	width	height	
31.0	24.0	9.0	Pilsbry, 1891, p. 113
24.3	19.0	6.0	Algoa Bay
22.0	17.0	5.0	Algoa Bay

Synonymy—

1848 *Patella pruinosa* Krauss, Südafr. Moll., Stuttgart, p. 56, pl. 3, fig. 9.

1855 *Patella pruinosa* Krauss, Reeve, Conch. Iconica, pl. 35, figs. 109 a, b.

1891 *Patinastra pruinosa* Krauss, Thiele in Troschel and Thiele, Das Gebiss der Schnecken, vol. 2, p. 325, pl. 28, fig. 24 (radula).

1891 *Helcion (Patinia) pruinosa* Krauss, Pilsbry, Man. Conch., vol. 13, p. 113, pl. 51, fig. 11; pl. 13, figs. 68, 69.

Helcion dunkeri (Krauss, 1848)

(Pl. 117, figs. 9, 10)

Range—South Africa, Natal.

Remarks—A thin oval shell, smaller than *pruinosis*, and differing from that species in being strongly radially ribbed and variously rayed with pink, red, or green but never with sky-blue spots.

Description—Shell small, up to 19.5 mm. (¾ of an inch) in length, very thin, subpellucid, ovate, narrowed anteriorly and rather depressed. Sculpture consisting of very numerous fine radiating lirae, with linear interspaces, the whole crossed by finer and more dense concentric threads. Colour variable, pinkish-white or pale green, radiately lined in pink, red or greenish-brown. Interior shining with the external pattern showing through; spatula indistinct, yellowish to greenish.

Measurements (mm.)—

length	width	height	
19.5	13.0	6.75	Port Alfred
17.0	11.0	4.6	Pilsbry, 1891, p. 148
15.0	11.0	4.0	Port Alfred

Synonymy—

1848 *Patella dunkeri* Krauss, Südafr. Moll., Stuttgart, p. 55, pl. 3, fig. 14.

1855 *Patella dunkeri* Krauss, Reeve, Conch. Iconica, pl. 38, figs. 124 a, b.

1891 *Helcioniscus dunkeri* Krauss, Pilsbry, Man. Conch., vol. 13, pl. 16, figs. 11-14.

1932 *Patella conspicua* Philippi, Turton, Mar. Shells Port Alfred, p. 168, sp. 1196 (in part).

1932 *Patella dunkeri formosa* Turton, Mar. Shells Port Alfred, p. 170, pl. 40, fig. 1211.

1932 *Patella testudinaria* Linn., Turton, Mar. Shells Port Alfred, p. 170, sp. 1212.

1932 *Patella rufoensis* Turton, Mar. Shells Port Alfred, p. 171, pl. 40, fig. 1213.

1932 *Patella gemmula* Turton, Mar. Shells Port Alfred, p. 171, pl. 40, fig. 1214.

1942 *Helcion dunkeri* Krauss, Tomlin and Stephenson, Proc. Malac. Soc., Lond., vol. 25, pt. 1, pp. 7, 8.

1948 *Helcion dunkeri* Krauss, Stephenson, Ann. Nat. Mus., vol. 11, pt. 2, p. 278, text fig. 10 (radula).

Records—SOUTH AFRICA: NATAL: Wahlberg (Krauss, 1848; type locality); Port Alfred (AWBP coll.).

[*These occasional blank areas occur between genera and subgenera to permit the insertion of new material and future sections in their proper systematic sequence.*]

Subfamily Nacellinae Thiele, 1929

This subfamily comprises *Cellana* and *Nacella*, with its subgenus *Patinigera*. The chief diagnostic character is in the radula. In the Patelinae it is relatively short and folded back upon itself, but in *Cellana*, and in some species of *Nacella* (*Patinigera*), it is very long, sometimes five times the length of the shell, and coiled in a spiral of several loops. In both *Nacella* and *Cellana* the form and arrangement of the teeth is markedly different from that of *Patella*. In *Patella* there are 4 or 5 central teeth, the median one being absent, vestigial or fully developed. The lateral is large with several prominent cusps, and the three marginals are slender, weakly-cusped and probably functionless. On the other hand, in *Cellana* there is a pair of closely-spaced, long, narrow centrals, alternating with a widely-spaced pair of similar laterals. Between the paired centrals there is a vestigial median plate. The three marginals are as in *Patella*. Both the centrals and the marginals rise vertically almost at right angles to their respective bases.

The gill cordon is interrupted by the head in *Cellana*, but is continuous in *Nacella* and its subgenus *Patinigera*. One feature, the epipodial fringe, is present only in *Nacella* and *Patinigera*.

The shell in the Nacellinae tends towards semi-translucence, is usually highly glazed to iridescent within in *Cellana*, but in *Nacella* (*Patinigera*), it has a bronzy internal lustre.

The genus *Cellana* is restricted to the Indo-Pacific, except in the New Zealand area, where relict populations extend down into the subantarctic. On the other hand *Nacella* and its subgenus *Patinigera* are exclusively cold water inhabitants of Antarctic and Subantarctic waters.

Genus *Cellana* H. Adams, 1869

Type: *Cellana cernica* (H. Adams, 1869)

Shell of similar shape to that of *Patella* but the interior is usually highly glazed and iridescent. The radula differs markedly from that of *Patella* but is very similar to that of *Nacella*. It consists of long recurved pairs of centrals, alternating with similarly-shaped pairs of laterals, usually with an incipient or vestigial median functionless central plate. The three marginals are very weak and functionless also. The whole radula is very

much longer than in *Patella*, sometimes five times the length of the body when straightened out. It lies to the right side of the body where it forms a spiral of up to four double coils.

A feature of the animal is the discontinuity of the gill cordon, which is interrupted by the head, unlike both *Patella* and *Nacella* in which the gill cordon is complete.

The genus is mainly confined to and widely distributed in the Indo-Pacific, ranging from Natal up the east coast of Africa to the Persian Gulf and Arabian Sea, then eastward along the Asiatic coasts to as far north as Japan, the islands of the Indian and Pacific Oceans to the Hawaiian Islands, Society Islands, Juan Fernandez, off the coast of Chile, Australia and New Zealand, including its subantarctic islands to as far south as Campbell Island.

Authentic fossil records for *Cellana* date back to the lower Miocene of both Australia and New Zealand, and *carpentariana* from the Northern Territory of Australia, which looks very like a *Cellana*, could extend the genus back to the lower Cretaceous.

Synonymy—

- 1869 *Cellana* H. Adams, Proceedings of the Zoological Society, London, p. 273. Type, by monotypy: *Nacella* (*Cellana*) *cernica* H. Adams, 1869.
 1871 *Helconiscus* Dall, American Journal of Conchology, vol. 6, part 3, p. 277. Type, by original designation: *Patella variegata* Reeve, 1842, which is *Patella capensis* Gmelin, 1791.

Cellana eucosmia (Pilsbry, 1891)

(Pl. 119)

Range—Red Sea and Gulf of Aqaba.

Remarks—This species belongs to the radiata series, but is nearer in shape to *karachiensis* than it is to typical *radiata*. From *karachiensis* it differs in sculpture, being finely radially ribbed, with about every fourth primary a trifle larger, and in

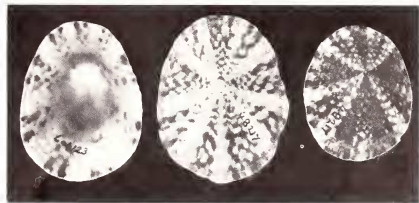


Plate 119. *Cellana eucosmia* Pilsbry, 1891. Ras Banas, Red Sea, 35.5—41.0 mm. AWBP coll. 48217.

its coloration of white flecks and dark maculations in the interstices of a nine-pointed star, the rays of which extend to the margin.

This is Reeve's 1854 version of his *variegata* of 1842, a very different shell, from unknown locality, but here considered to be a synonym of *radiata capensis*. The name *variegata*, however, is not acceptable as of Reeve at either presentation, since there are two prior usages of that name in *Patella*, one of Röding, 1798, and the other of Blainville, 1825.

Dall (1870) correctly localised Reeve's 1854 *variegata* as coming from the Red Sea area, not Australia, as claimed by Reeve. Then in 1891, Pilsbry provided a new name, *eucosmia*, for the *variegata* of Reeve, 1854, and cited the following localities for it—"Suez, Red Sea and Gulf of 'Akaba," Japan and Australia." However, in 1895, in the Stearns "Catalogue of the Marine Mollusca of Japan," pp. 112, 113, Pilsbry, without reasons, switched his *eucosmia* to cover a very different, common Japanese *Cellana*, even adding that "The species is not known from any locality outside of Japan." Pilsbry's 1891 original proposition must stand for the name of the Red Sea *Cellana*, since it was clearly introduced as a new name for the 1854 *variegata* of Reeve, bourn out also by the description, based upon Reeve's 1854 figures.

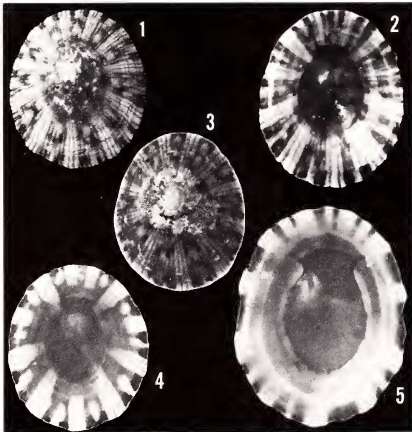


Plate 120. Figs. 1-5. *Cellana radiata* (Born, 1778). Fig. 1. Mt. Lavinia, Ceylon, 22 mm., AWBP coll. 48269. Figs. 2, 3. Colombo, Ceylon, 25-29 mm., AWBP coll. 224978. Fig. 4. Gignoto, Catanduanes Island, Philippines, 23 mm., AWBP coll. 223090. Fig. 5. Fitzroy Island, Queensland, 25.5 mm., (*pictulata* form), AWBP coll. 45526.

Description—Shell rather large for the *radiata* group, up to 45 mm. (1½ inches) in length, ovate, slightly narrowed anteriorly, and of rather low profile, the apex at a little anterior to the middle; anterior slope straight, posterior slope arched. Sculpture consisting of very numerous narrow radial ribs, weakly but densely scaly where crossed by fine concentric lamellae and growth lines. The radials are fairly even, except that about every fourth one is a trifle larger. Colour of exterior pale yellowish brown, with white flecks and dark-brown maculations in the interstices of a pale-brown, nine-pointed star pattern. Interior yellow, with the dark-brown maculations showing through, except for the spatula, which is dark chestnut-brown, usually more or less clouded with white callus.

Measurements (mm.)—

length	width	height	
44.0	35.0	12.0	Ras Banas, Red Sea
40.0	31.0	11.0	Ras Banas, Red Sea
35.5	28.5	12.5	Ras Banas, Red Sea
30.0	24.0	9.0	Berbera, Gulf of Aden

Synonymy—

- 1854 *Patella variegata* Reeve, *Conch. Iconica*, pl. 16, figs. 36 a-c. "Australia," in error. (non Reeve, 1842, *Conch. Syst.*, 2, pl. 136, fig. 1).
 1870 *Patella variegata* Reeve (1854), Fischer, *J. de Conchyl.*, 18, p. 167. Suez, Egypt.
 1870 *Helcioniscus variegatus* Reeve, Dall, *Amer. Journ. Conch.*, 6, p. 277, pl. 16, fig. 27 (radula); locality corrected to Red Sea and Gulf of Aqaba).
 1891 *Helcioniscus eucosmia* Pilsbry, *Man. Conch.*, vol. 13, p. 148, pl. 71, figs. 61-64 (non Pilsbry, 1895, *Cat. Mar. Moll. Japan*, p. 112, pl. 7, figs. 7-10; Japan).

Records—RED SEA; Gulf of Aqaba (Dall, 1870); Ras Banas (AWBP coll.); Berbera, Gulf of Aden (USNM).

Cellana radiata (Born, 1778)

Unfortunately the better-known name for this species, *Patella rota* Gmelin, 1791, must fall as a synonym of *Patella radiata* Born, 1778. No locality was given for Born's species, but without doubt, the shell he described (1778) and figured (1780) is the common Indian and Ceylon form of the limpet known as *rota*.

The overall distribution of *radiata* is East Africa from Natal northward to the Arabian Sea, India, Ceylon, and the Asiatic mainland to southern Japan, the islands of the Indian Ocean, northern Australia, the Philippines, Palau Islands, Solomons down to New Caledonia, and eastward across the Pacific to as far as the Marquesas.

This widely-distributed Indo-Pacific limpet is an exceedingly variable one, but nevertheless

several of the more distinctive variants qualify for consideration as geographical subspecies.

Relevant synonymy and locality data are listed separately under the respective subspecies.

***Cellana radiata subspecies radiata* (Born, 1778)**

(Pl. 67, figs. 8, 9; Pl. 120)

Range—India, Ceylon, West New Guinea and Philippine Islands.

Remarks—In this the assumed typical form of *radiata* the sculpture consists of numerous, narrow, approximately-equal, flat-topped, radial riblets, with linear interspaces. There are no underlying radial folds, and the shape is regularly and broadly ovate. The coloration is exceedingly variable and of no diagnostic significance.

Description—Shell of moderate size, up to 37 mm. (1-7/16 inches) in length, of rather light build, roundly ovate, and with a subcentral nucleus. Sculpture consisting of numerous, regular, narrow, flat-topped radial riblets, separated by linear grooves. Coloration variable, the typical form maculated with 9 to 11 bifid radial streaks in purplish brown, upon a yellowish ground, the spatula chestnut-brown, except when varyingly clouded with whitish callus. In some examples the radial streaks are broken up into sparse dashes and chevrons. In *forma aster* Reeve, 1855, from unknown locality, the purplish brown radial maculations are about nine, are very broad, and they alternate with narrow yellowish interspaces. In *forma luzonica* Reeve, 1855, from the Philippines, there is a bold radiate pattern of irregular black streaks upon a transparent yellow ground; in *forma scalata* Reeve, 1855, also from the Philippines, most of the radial maculations become forked towards the margin, and in *forma petalata* Reeve, 1854, from North Queensland, Australia, the radial maculations in most examples join up to form a few broad bands.

Measurements (mm.)—

length	width	height	
37.0	33.0	14.0	Galle, Ceylon
31.0	26.0	9.0	Galle, Ceylon
29.0	25.5	11.5	Colombo, Ceylon
25.5	20.0	8.0	Fitzroy Id., N. Queensland
23.0	19.0	10.0	Colombo, Ceylon
21.0	17.0	7.0	Philippines (<i>f. luzonica</i>)

Synonymy—

- 1778 *Patella radiata* Born, Index Revum Nat. Mus. Caes. Vind., p. 443: 1780, pl. 18, fig. 10.
 1791 *Patella rota* Gmelin, Linn. Syst. Nat., ed. 13, 1, p. 3720; based upon Martini-Chemnitz, Conch. Cab., vol. 10, p. 330, pl. 168, fig. 1619. East Indies and (in error) West Indies.

- 1832 *Patella reynaudi* Deshayes, Bellanger's Voy. aux Indes-Orient., Zool., p. 411. Ceylon Atlas, pl. 2, figs. 11, 12.
 1854 *Patella petalata* Reeve, Conch. Iconica, pl. 22, figs. 56a, b. Australia. Dec. 1854.
 1855 *Patella aster* Reeve, Conch. Iconica, pl. 30, figs. 80 a, b. Unknown locality. Jan. 1855.
 1855 *Patella luzonica* Reeve, Conch. Iconica, pl. 31, figs. 86a, b. Luzon Island, Philippines. Jan. 1855.
 1855 *Patella scalata* Reeve, Conch. Iconica, pl. 31, figs. 89 a, b. Philippines. Jan. 1855.
 1855 *Patella nimbus* Reeve, Conch. Iconica, pl. 42, figs. 143 a, b. Unknown locality. May 1855.
 1891 *Helcioniscus reynardi* (sic) Desh., Pilsbry, Man. Conch., vol. 13, p. 130, pl. 66, figs. 94, 95.
 1911 *Acmaea travancorica* Preston, Rec. Indian Mus., vol. 6, p. 39. Travancore, India.
 1911 *Acmaea bombayana* E. A. Smith, Proc. Malac. Soc., London, vol. 9, p. 357, text figs. A-C. Bombay, India.
 1911 *Acmaea bombayana* var. *ceylanica* E. A. Smith, Proc. Malac. Soc., London, vol. 9, p. 358, text fig. D. Galle, Ceylon.

Records—INDIA: Bombay (USNM 443304); Varkal, Travancore (type of *Acmaea travancorica*). CEYLON: Colombo (AWBP coll.); Mt. Lavinia (AWBP coll.); ¼ mile S. W. of Delhiwala Village, Colombo (ANSP 224978); Galle (ANSP and AWBP coll.); SABAH; Labuan (Aust. Mus.). WEST NEW GUINEA: Boensaki Island, off Soweck, Soeperi Island, Schouten Islands (AWBP coll.). PHILIPPINES: Gignoto, Catanduanes Island (ANSP); Luzon Island (type locality of *Patella luzonica*). QUEENSLAND: Cairns; Fitzroy Island (both AWBP coll.).

***Cellana radiata subspecies capensis* (Gmelin, 1791)**

(Pl. 67, figs. 10, 11; Pl. 121)

Range—East coast of South Africa and Natal north to Zanzibar.

Remarks—This subspecies has subobsolete to obsolete radial folds, with a superimposed sculpture of radial riblets that are dense, linear-spaced and granulose to scabrous. The dark-brown radial markings tend to run together to form a few large squarish maculations, and the spatula usually has a dark bar across it near the top, except in heavily callused adults when an orange smear takes its place.

Gmelin based his species upon "Argenville Conch. pl. 1, fig. 0" and "Kaemmerer Conch. Rudolphi, figs. 1, 2." The Argenville plates are numbered differently in the several editions of that work, so to avoid confusion, Gmelin's second reference, that of Kaemmerer, 1786, pl. 2, figs. 1, 2, is here selected as the basis of the subspecies, and this action is in accord with the generally accepted concept of *capensis* and coincides with the admirable illustrations in Krauss, 1848.

Description—Shell of moderate size, up to 39 mm. (1½ inches) in length, rather lightly built, except in the fully adult; ovate to elongately-ovate, with the anterior end slightly narrowed, depressed

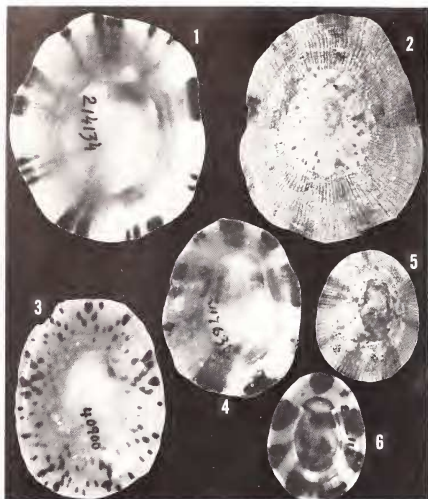


Plate 121. Figs. 1-6. *Cellana radiata* subspecies *capensis* (Gmelin, 1791). Fig. 1. Chukwani Palace, Zanzibar, 35 mm., AWBP coll. 214134. Figs. 2, 3. Kizimkazi, Zanzibar, 31-37 mm., AWBP coll. 40900. Figs. 4-6. Pondoland, South Africa, 24-33 mm., AWBP coll. 211763b.

to moderately elevated, and with the apex varying from subcentral to the anterior third. Sculpture consisting of very numerous, fine, linear-spaced, weakly granulose or scabrous radials. Margin finely denticulated. The nine radial folds, so characteristic of some of the other *radiata* subspecies, are subsobsolete to obsolete in *capensis*. Colour of interior, yellowish with a silvery lustre, an orange to chestnut-brown spatula, and a few broad radial rays of dark purplish brown. Almost invariably the spatula has a dark-brown blob, running in from the right, at just below the constriction. Fully adult and senile examples often have the spatula obliterated by a whitish callus, and in these there is usually a smear of bright-orange at the head end of the spatula.

Measurements (mm.)—

length	width	height	
39.0	29.0	—	Pilsbry, 1891, p. 146
37.0	29.0	12.5	S. W. Zanzibar
33.0	26.0	14.0	Pondoland
28.0	23.5	8.5	Port Edward, Natal

Synonymy—

1791 *Patella capensis* Gmelin, Syst. Nat. ed. 13, p. 3720, based upon Kaemmerer, Conch. Rudolft. pl. 2, figs. 1, 2.

- 1842 *Patella variegata* Reeve, Conch. Systematica, vol. 2, p. 15, pl. 136, fig. 1.
 1848 *Patella capensis* Gmelin, Krauss, Südafr. Moll., Stuttgart, p. 53, pl. 3, fig. 13.
 1891 *Helcioniscus capensis* Gmelin, Pilsbry, Man. Conch., vol. 13, p. 146, pl. 16, figs. 15-17.
 1948 *Cellana capensis* Gmelin, Stephenson, Ann. Natal Mus., vol. 11 (2), pp. 279, 282; text fig. 11 (radula).

Records—SOUTH AFRICA: "Cape of Good Hope" (type locality); Coffee Bay, 1 mile S. of Umtata River, Transkei (V. Orr, 1955; ANSP); Port St. Johns, Pondoland (V. Orr, 1955; ANSP); Port Edward, Natal (V. Orr, 1955; ANSP) near Durban (Mrs. N. Prior); ZANZIBAR: Dembiani, 2 miles N. of Kizimkazi (AWBP coll.); Chukwani Palace (ANSP); Mangawani (ANSP).

Cellana radiata subspecies
enneagona (Reeve, 1854)

(Pl. 67, fig. 14; Pl. 121)

Range—Madagascar, Andaman Islands, Indonesia, Philippines and Bonin Islands, Japan.

Remarks—The elongated, narrowly ovate shape, nine prominent radial folds, and irregularly indented margin, characterise this form or subspecies.

Description—Shell moderately large, up to 53 mm. (2½ inches) in length but usually smaller, narrowly ovate to irregularly angular, with the apex between the center and the anterior third. Sculpture consisting of 9 conspicuous, rounded, radial folds. The entire surface, folds and interspaces alike, is crowded with narrow, crisp radial cords that are rendered slightly scabrous by concentric growth lines. Margin of shell irregular, being strongly projecting at the terminal points of the radial folds, and concave in the interspaces. Colour pattern of interior variable, consisting of radial dark purplish brown streaks upon a pale creamy ground, or the streaks may either ramify towards the margin or break up into tessellated patterns. Usually there are 9 narrow radial areas free from colour pattern, and these correspond to the external folds. Spatula long and narrow, dark-chestnut, sometimes white-callused to a varying degree.

Measurements (mm.)—

length	width	height	
53.5	43.0	13.5	Jackson Beach, Bonin Islands
39.0	32.0	10.5	Jolo, Philippines
30.0	21.0	5.5	Catbalogan, Philippines
25.0	20.0	6.0	Andaman Islands

Synonymy—

- 1854 *Patella enneagona* Reeve, Conch. Iconica, pl. 18, figs. 4a, b. Unknown locality. Dec. 1854.
 1855 *Patella articulata* Reeve, Conch. Iconica, pl. 33, figs. 97 a, b. Island of Ticao, Philippines, Mar. 1855.
 1891 *Helcioniscus enneagona* Reeve, Pilsbry, Man. Conch., vol. 13, p. 152, pl. 28, figs. 35, 36.
 1891 *Helcioniscus articulatus* Reeve, Pilsbry, Man. Conch., vol. 13, p. 128, pl. 65, figs. 87, 88.
 1959 *Cellana enneagona* Reeve, Oyama and Takemura, The Moll. Shells, vol. 3, *Cellana*, pl. 2, figs. 6-8.

Types—Three syntypes of *articulata* are in the British Museum (Natural History).

Records—MADAGASCAR: Pointe Ambarionambi, S. E. of Nossi Be' (ANSP); Nosi Antsaibory, N. W. Nossi Be' (ANSP); Nosi Tanikely, 4 miles S. of Nossi Be' (ANSP); Pte du Cratere, S. W. Nossi Be' (ANSP); Nossi Iranja, 32 miles S. W. of Nossi Be' (ANSP). ANDAMAN ISLANDS: Port Blair (AWBP coll.). INDONESIA: Bali (AWBP coll.). PHILIPPINES: Ticao Island (type of *articulata*); Calcaben, S. E. Bataan, Luzon Island, rocky shore (ANSP); Iba, Zambales, Luzon (ANSP); Jolo (USNM); Catbalogan, Samar (USNM). JAPAN: Jackson Beach, Bonin Islands (USNM).

***Cellana radiata* subspecies
orientalis (Pilsbry, 1891)**

(Pl. 67, figs. 12, 13; Pls. 123 and 124)

Range—Indonesia, New Guinea, North Western Australia, southern Japan, Palau Islands, Solomon Islands, New Caledonia, Loyalty Islands, Fiji, Tonga, Samoa and Marquesas Islands.

Remarks—This subspecies or form differs from the typical one in the presence of very distinct radial folds that underlie the normal radial sculpture. The colour pattern is variable, ranging from buff with sparse dark-brown chevrons, to broad radial dark stripes, each one occupying an inter-space. It is likely that the latter colour form is *Patella tessellata* Hombron & Jacquinot, 1841, preoccupied, and later renamed *Patella hombroni* Dautzenberg & Bouge, 1933. Unfortunately I am unable to verify the identity of *hombroni* since

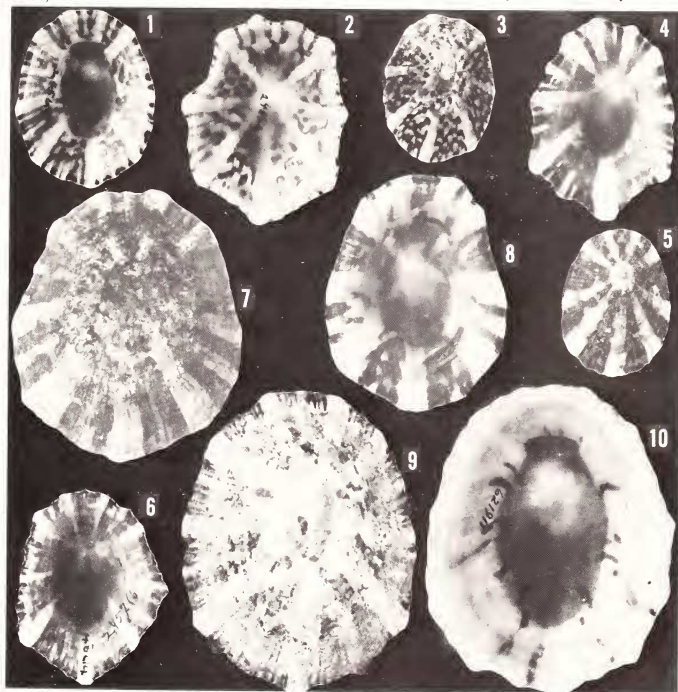


Plate 122. Figs. 1-10. *Cellana radiata* subspecies *enneagona* (Reeve, 1854). Figs. 1-3. Jolo, Philippines, 28-39 mm., USNM 245660. Figs. 4-6. Janelo Bay, Luzon, Philippines, 27-36 mm., AWBP coll. 48214. Figs. 7, 8. Pointe Ambarionambi, Nossi

Be', Madagascar, 30-36 mm., AWBP coll. 45742. Figs. 9, 10. Jackson Beach, Bonin Islands, Japan, 40-53.5 mm., AWBP coll. 621911.

the Lesson types were not available at the time of writing.

Description—Shell of moderate size, up to 41.5 mm. ($1\frac{1}{2}$ inches) in length, rather solid, roundly ovate, and with a subcentral nucleus. The dense linear-spaced radial riblets are superimposed upon an underlying sculpture of bold, distant, radial folds, 11 or more in number, and these strongly corrugate the margin. The coloration is variable. In the typical form the radiating dark-brown lines or streaks tend to anastomose towards the margin, there forming a series of rectangular blotches. In the *eudora* form the dark markings are small, sparse, often chevron-shaped, and they show through to the interior, which varies from buff to bright lemon-yellow. This form is widely distributed, ranging from Java to Japan and down through the Solomons to New Caledonia. In the form from the eastern extremity of the *radiata*

range, Samoa and the Marquesas Islands, the radial lines of the interior tend to run together and form broad, dark-brown, radial maculations, corresponding to the interspaces of the external radial folds.

Measurements (mm.)—

length	width	height	
41.5	36.0	11.5	Marquesas Islands
34.5	30.0	15.0	holotype of <i>orientalis</i>
32.0	27.5	9.0	Tau Id., Samoa
28.0	25.0	12.0	holotype of <i>eudora</i>
24.0	20.5	7.0	Russell Ids., Solomons

Radula—The radula is typical of *Cellana*, with a very weak and small medio-central vestigial plate between a pair of long, narrow, fully-developed centrals that curve forward tangentially above, and alternate with a pair of broader laterals, that are wider-spaced. Both the centrals and the laterals are indented along one edge to form two or three cusps.

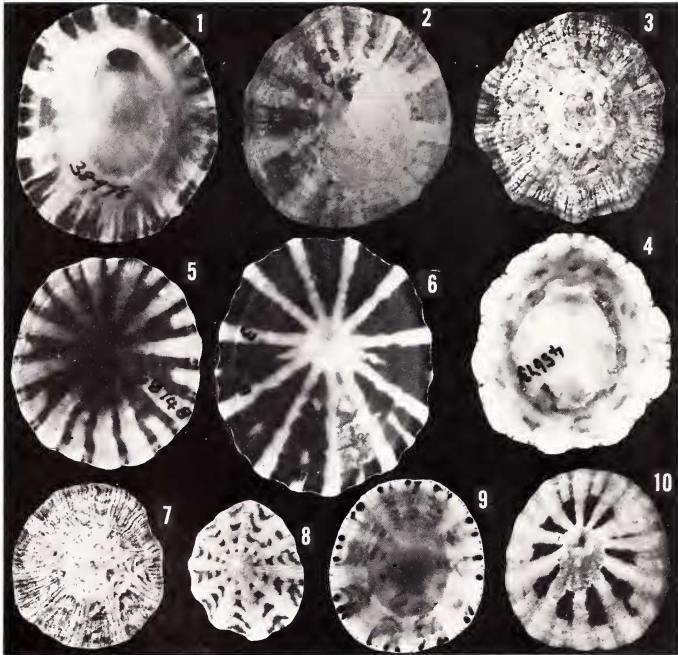


Plate 123. Figs. 1-10. *Cellana radiata* subspecies *orientalis* (Pilsbry, 1891). Fig. 1. Fiji, 34.5 mm. (lectotype of *orientalis*), ANSP. Fig. 2 (paralectotype of *orientalis*), ANSP. Figs. 3, 4. Lifu, Loyalty Islands, 27 mm. (*eudora* form), AWBP coll. 45673. Fig. 5. Niuaufu Island, Tongan Group,

27 mm., AWBP coll. 48748. Fig. 6. Tau Island, Manua Group, Samoa, 32 mm., USNM 513368. Figs. 7-9. Lingatu Point, Banika Island, Russell Islands, Solomon Islands, 15-27 mm., Domin Mus. Fig. 10. Tonga, 23.5 mm., AWBP coll. 25349.

Synonymy—

- 21841 *Patella tessellata* Hombron & Jacquinot, Ann. Sci. Nat., Zool. & Paleont., ser. 2, vol. 16, p. 190 Mangareva. (non O. F. Müller, 1779).
- 1891 *Helcioniscus rota* var. *orientalis* Pilsbry, Man. Conch., vol. 13, p. 146, pl. 72, figs. 76, 77. Fiji.
- 21933 *Patella hombroni* Dautzenberg & Bouge, J. de Conchyl., vol. 77, p. 416 (nom. nov. pro. *P. tessellata* H. & J., 1841).
- 1938 *Cellana rota*: Adam & Leloup, Mem. Mus. Roy. D'Hist. Nat. Belg., vol. 2, pt. 19, p. 12, pl. 2, fig. 3 (shell), text fig. 3 (radula). Java.
- 1940 *Cellana eudora* Iredale, Aust. Zool., vol. 9, pt. 4, p. 433, pl. 33, figs. 13-15, Lifu, Loyalty Islands.
- 1959 *Cellana rota*: Oyama & Takemura, The Moll. Shells, vol. 3, *Cellana*, pl. 2, figs. 3-5. Japan.
- 1964 *Cellana rota*: Habe, Shells of Western Pacific in colour, vol. 2, pl. 3, fig. 5. Japan.

Types—Lectotype, Pilsbry's figured specimen of *orientalis*, here selected, and three syntypes, in the Academy of Natural Sciences of Philadelphia. Holotype of *eudora* in the Australian Museum, Sydney.

Records—JAPAN: Amami Islands (Habe, 1964). GUAM (USNM); PALAU ISLANDS: S. E. end of Eil Malk (ANSP). INDONESIA: Java (Adam & Leloup, 1938). N. W. AUSTRALIA: Vansittart Bay (Aust. Mus.); SOLOMON ISLANDS: Lingatu Point, Banika Island, Russell Islands, high tide on coral rock (Domin. Mus.); coast near Kopiu, southern Guadalcanal, on exposed rock platform (Domin. Mus.); Ysabel (Aust. Mus.). NEW CALEDONIA: N. of Toula (AWBP coll.); La Roche Percée, Bourail (ANSP). LOYALTY ISLANDS: Lifu (type locality of *eudora*). TONGA: (AWBP coll.); Niuafoou Island (AWBP coll.). FIJI: (type locality of *orientalis*). MAR-

QUESAS ISLANDS: Atuona Bay, Hivaoa Island (H. A. Pilsbry, Pinchot Exped., 1929; AWBP coll.); Taihoa, Nukuhiva Island (H. A. Pilsbry, Pinchot Exped., 1929; ANSP). SAMOA: Tau Island, Manna Group (USNM).

Cellana deformis (K. Martin, 1883)

Range—Miocene of Tiji Taon, Java.

Remarks—This species is inadequately illustrated by a side elevation only. It shows marked corrugations, similar to those of *Cellana radiata* subspecies *orientalis* (Pilsbry, 1891), but until the type material is examined, an exact evaluation of the species cannot be made.

Synonymy—

- 1883 *Patella deformis* K. Martin, Samml. Geol. Reichs-mus. Leiden, vol. 1, p. 236, pl. 11, fig. 31.

Cellana karachiensis (Winckworth, 1930)

(Pl. 126)

Range—Gulf of Oman to Pakistan.

Remarks—This species seems to be nearest to *livescens* Reeve, 1855 (formerly *cernica* H. Adams, 1869) from Mauritius which also has 9-10 broad radiate bands of dark reddish brown, upon a yellowish ground, as well as a moderate development of the 9-folds. *P. livescens*, however, is more elongately ovate, and flatter, with the apex at about the anterior third.

Description—Shell rather large, up to 57 mm. (2¼ inches) in length, broadly ovate, slightly narrowed in front, and moderately elevated, with rounded slopes, and a subcentral nucleus; margin smooth to very weakly crenulated. Sculpture of dense, crisp, radial riblets, rendered granulose by concentric growth lines; riblets varying between 120 and 180, with about 20 of them slightly stronger than the rest, and in some examples there is a subobsolete indication of the "9-fold" state, reminiscent of the *enneagona* subspecies of *radiata*. Colour of exterior, pale brownish-buff, with eleven broad radiate bands of deep reddish-brown; internally the spatula is chestnut-brown, often clouded over with pale fawn callus, and surrounding the spatula is a zone of yellow, merging with silver towards the margin, the external brown pattern showing through; juveniles have a sparse pattern of radiate reddish-brown dashes on a yellowish ground.

Measurements (mm.)—

length	width	height	
57.0	46.5	20.0	East Pier, Karachi
42.0	36.7	17.5	East Pier, Karachi
41.5	33.0	12.0	Muscot
35.0	29.0	15.0	holotype

Plate 124. *Cellana radiata* subspecies *orientalis* (Pilsbry). Fig. 1. Banika Island, Russell Islands, Solomons. Radula. Fig. 2. Bali, Indonesia. Radula, from Adam and Leloup, 1938. Fig. 3. Fiji. Fig. 3 (as *rota* Guclim).

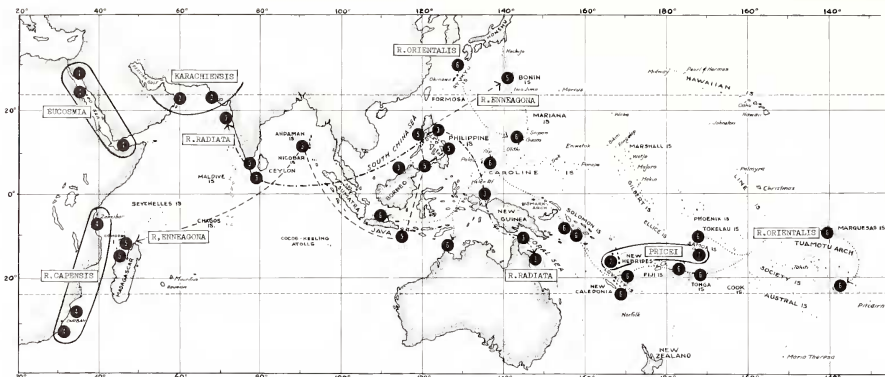


Plate 125. Geographical distribution of *Cellana radiata* (Born), its subspecies and related species. Fig. 1. *Cellana cucosmia* (Pilsbry). Fig. 2. *Cellana karachiensis* (Winckworth). Fig. 3. *Cellana radiata* (Born). Fig. 4. *Cellana radiata* sub-

species *capensis* (Gmelin). Fig. 5. *Cellana radiata* subspecies *emagoga* (Reeve). Fig. 6. *Cellana radiata* subspecies *orientalis* (Pilsbry). Fig. 7. *Cellana pricei* Powell (new species).

Synonymy—

1930 *Patella capensis karachiensis* Winckworth, Proc. Malac. Soc., London, vol. 19 (2), p. 80. Not figured.

Types—Holotype and paratype in the British Museum (Natural History).

Records—PAKISTAN: East Pier, Karachi (type locality); oyster rocks, Karachi (Winckworth coll., British Mus. (Nat. Hist.)); GULF OF OMAN: Muscat (ex. Winckworth; AWBP coll.).

Cellana livescens (Reeve, 1855)

(Pl. 127)

Range—Mauritius.

Remarks—This is a moderately large, rather thin-shelled limpet of low elevation, easily recog-

nised by its striking colour pattern of nine broad purplish brown radial bands, separated by narrow golden-yellow rays; there is a whitish spatula, and the whole of the interior is highly iridescent. It is regrettable that *cernica*, type of the genus *Cellana*, must fall as a synonym of *livescens*, described in error from Mazatlan, west Mexico, but in reality the well-known Mauritian limpet.

Description—Shell moderately large, up to 51 mm. (2 inches) in length, rather flat, elongately ovate, with a weakly scalloped margin, and a flattened apex at about the anterior third. Sculpture consisting of about 100 or more fine, crisp, slightly scabrous radials of varying sizes, and in addition there are the 9 broadly rounded, radial

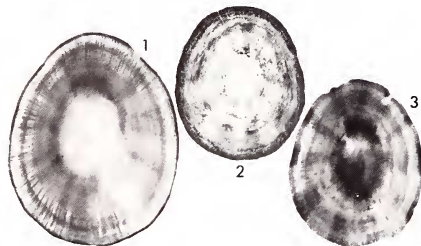


Plate 126. Figs. 1-3. *Cellana karachiensis* (Winckworth, 1930). Fig. 1. Karachi, Pakistan, 57 mm., AWBP coll. 46136. Figs. 2, 3. Muscat, Gulf of Oman, 41 mm., AWBP coll. 46142.

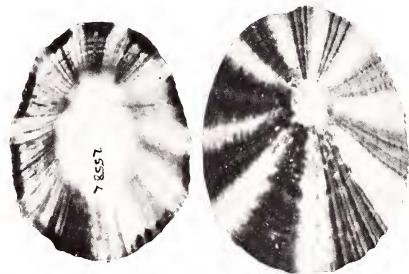


Plate 127. *Cellana livescens* (Reeve, 1855), Mauritius, 34-40 mm., AWBP coll. 25582.

fold, similar to those of the *emeagone* subspecies of *radiata*; although little raised, these folds are quite distinct in all the material examined. Colour of exterior, olive to pinkish grey, with 9 broad, radiate bands of dark purplish brown; internally the spatula is white to bluish-grey, the remaining area with the external purplish brown radials showing through strongly; the narrow interspaces, corresponding to the external folds, are bright golden-yellow; the whole highly iridescent.

Measurements (mm.)—

length	width	height	
51.0	41.0	12.5	Mauritius
39.0	29.0	10.0	Mauritius holotype
36.0	28.0	10.0	Mauritius

Synonymy—

- 1834 *Patella novemradiata* Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. 3, p. 346, Mauritius. (non G. Fischer, 1807).
 1855 *Patella livescens* Reeve, Conch. Iconica, pl. 29, figs. 75 a, b. "Mazatlan, Gulf of California," in error. June 1855.
 1869 *Nacella (Cellana) cernica* H. Adams, Proc. Zool. Soc., London, p. 273, pl. 19, figs. 7, 7a. Barkly Island, Mauritius.
 1891 *Helcioniscus novemradiatus* Quoy and Gaimard, Pilsbry, Man. Conch., vol. 13, p. 146, pl. 30, figs. 55-58.
 1891 *Helcioniscus cernica* Reeve, Pilsbry, Man. Conch., vol. 13, p. 149, pl. 71, figs. 59, 60.
 1891 *Helcioniscus livescens* Reeve, Pilsbry, Man. Conch., vol. 13, p. 152, pl. 73, figs. 99, 100.

Types—The type specimens of *livescens* should be in the British Museum (Natural History) but I have not been able to locate them.

Records—MAURITIUS: Barkly Island (type locality); AWBP coll.

Cellana pricei Powell *new species*

(Pl. 128)

Range—Samoa and New Hebrides.

Remarks—This species is easily recognised by its dark silvery grey to greenish black colour, relieved by short marginal white streaks at the extremities of the primary radials. Apparently the species is restricted in habitat to dark volcanic rock. The relationship is with the *radiata* series, but the shell is sufficiently distinct, particularly in sculpture, to discount the possibility of it being merely an ecotype.

Description—Shell of moderate size, 35.6 mm. (1½ inches) in length, ovate, with irregularly corrugated margins, depressed, with the apex varying between subcentral and the anterior third. Sculpture rather coarse and irregular, of rounded radial ribs, 14 or 15 of them of primary strength, and these project at the margins, slightly more than do the corrugations between them. The whole surface is crossed by dense crisp sublammellose concentric lirae. Colour of exterior greenish black, with an elongated white streak towards the margin upon most of the primary radials; interior dark silvery grey, with the spatula dark olive-brown, clouded in part by a bluish white callus. The marginal white streaks of the exterior show through strongly upon the inner surface.

Types—The holotype is in the Auckland Museum (TM.1337).

Measurements (mm.)—

length	width	height	
35.6	28.0	8.5	holotype
27.0	21.75	7.0	paratype

Records—WESTERN SAMOA: Upolu, half-tide near Apia, on black volcanic rocks (L. Price, 1964); Upolu (Col. R. W. Tate, 1920; Domin. Mus. MF. 83). NEW HEBRIDES: reef near hotel, Tanna (W. F. Ponder, 1968).

Cellana garconi (Deshayes, 1863)

(Pls. 129, 130, 132)

Range—Island of Reunion and northern Madagascar.

Remarks—The writer has seen neither the type nor a photograph of this species. The type was not available at the time of writing, owing to reorganisation of the collections of the Muséum National d'Histoire Naturelle, Paris. It is not certain that the type is located in the collections of that institution.

However Deshayes' excellent illustrations show a shell very similar to a common shell from northern Madagascar, the only marked difference being in the position of the apex, which is shown

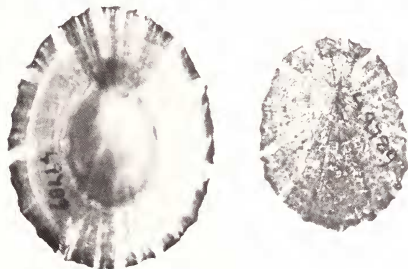


Plate 128. *Cellana pricei* Powell, new species, near Apia, Upolu, Samoa. Holotype, 35.6 mm. and paratype, 27 mm.

near central in Deshayes' figures but is at about the anterior fourth or fifth in Madagascar shells. Deshayes' shell is tall-conic, but the Madagascar shells are very depressed. However the position of the apex, which is to a great extent governed by the altitude of the shell, varies considerably within many species of limpets, and is therefore of little taxonomic importance.

Upon the assumption that the Madagascar shells represent *garconi*, then that species appears to be related to the Indo-Pacific *testudinaria* and represents a western offshoot of that species, just as *vitiensis* (= *sagitata*) is an eastern outlier in the Pacific.

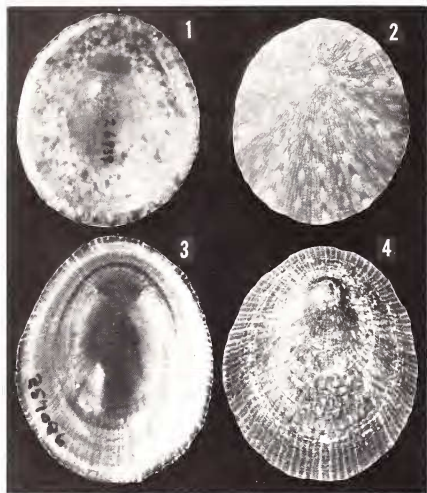


Plate 129. Figs. 1, 2. *Cellana vitiensis* Powell, new name pro *Patella sagittata* Gould, 1846, non Donovan, 1820; Fiji, 34 mm., AWBP coll. 26939. Figs. 3, 4. *Cellana garconi* (Deshayes, 1863), Nossi Bé, Madagascar, 31.5 mm., AWBP coll. 257086.

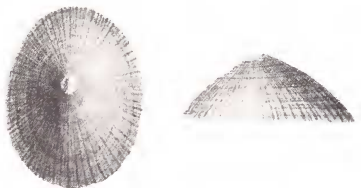


Plate 130. *Cellana garconi* (Deshayes, 1863), Island of Reunion. Original figures from Deshayes, Moll. de l'Île Réunion, pl. 6, figs. 11, 12.

The main differences in *garconi*, compared with *testudinaria*, are the smaller, more lightly built shell, with dense more definite sculpture, the radials being very numerous, and bearing distinct ovate granules; also the shell tends to be narrow in front, and never has the chevroned or tortoise-shell markings of *testudinaria*.

Description (translation from Pilsbry, 1891, l. c.)—Shell "regularly oval, conoidal, the summit elevated, pointed, very slightly directed forward, situated at the front two-fifths of the length. From the apex radiate a great number of very fine, regular, rather equal riblets, which bear long, obtuse granules. The margins are simple and sharp. The interior lined with very bright nacre of a whitish-brown, the central callus quite large, white, sharply defined by the muscle-scar. The shell is thin, semi-transparent, of a uniform brown-blackish, but if held up toward the light, a few rays of a beautiful red become visible."

Measurements (mm.)—

length	width	height	
31.0	25.7	7.0	Nossi Bé, Madagascar
25.0	19.5	5.0	Nossi Bé, Madagascar
23.0	19.0	9.0	type of <i>garconi</i>

Radula (Nossi Bé specimen)—Very similar to that of *testudinaria*, except for the lateral, which is short, broadly arched and expanded above, and very deeply notched.

Synonymy—

- 1863 *Patella garconi* Deshayes, Moll. de l'Île Réunion, p. 42, pl. 6, figs. 11, 12.
 1891 *Helcioniscus garconi*: Pilsbry, Man. Conch., vol. 13, p. 150, pl. 66, figs. 100, 101.

Records—ISLAND OF REUNION (type locality). MADAGASCAR, south side of Nossi Iranja, 32 mi. S. W. of Nossi Bé (ANSP Exped. Sept.-Oct. 1960); Pte. du Cratere, S. W. Nossi Bé (ANSP); between Ambatoloaka and Madirokely, S. W. Nossi Bé (ANSP).

Cellana testudinaria (Linnaeus, 1758)

(Pl. 67, figs. 1, 2; Pl. 131; Pl. 132, fig. 1)

Range—Andaman Islands to the Ryukyu Islands and to New Caledonia and North Queensland.

Remarks—This is a large, solid, broadly ovate, and rather depressed *Cellana*, externally rather smooth, of brownish slate colour, radially patterned in darker brown, and bluish silvery within. This widely distributed Indo-Pacific species is almost invariably associated with dark volcanic rock, and occurs near and below low tide in exposed situations. Pilsbry's *Helcioniscus rota* var. *discrepanis* proves to be a synonym of *testudinaria*. The type material consists of two undersized,

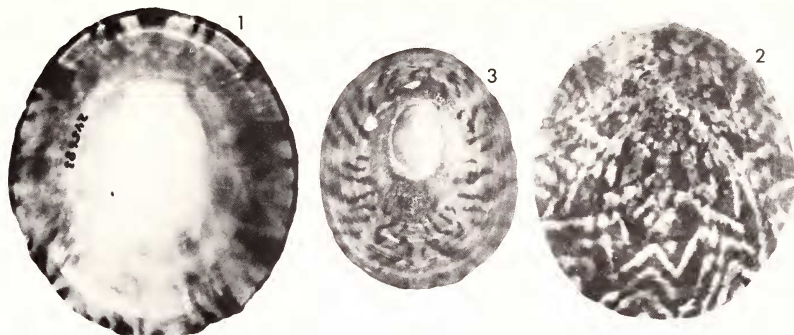


Plate 131. Figs. 1-3, *Cellana testudinaria* (Linnaeus, 1758). Figs. 1, 2, Port Tiliq, Lubang, Philippine Islands, 73.5 mm., USNM 245683. Fig. 3. Lectotype of *Helcioniscus rota* var.

discrepans Pilsbry, 1891, 29 mm.; an eroded young *testudinaria* from unknown locality.

badly worn examples from unknown locality. Another synonym is Dunker's *insignis* which Fraunfeld claimed as coming from the Cape of Good Hope, but almost certainly incorrectly. Fraunfeld's figure looks like *testudinaria*, but there is no other record of the species from that area.

Two related smaller species, also with a preference for dark volcanic rock, extend the range of the *testudinaria* type of *Cellana*, to the westward in *garconi* of the Madagascar-Reunion area, and to the eastward in *vitiensis*, the latter apparently being restricted to the Fiji Islands.

Description—Shell solid, reaching a large size, up to 90 mm. ($3\frac{3}{8}$ inches) in length, but most adults about two thirds that size; broadly ovate, of low rounded profile, with the apex at about the anterior third; margin simple and smooth. External sculpture consisting of weak to obsolete, low, narrow, smooth radial riblets. Colour of exterior dark greenish brown, with a radiate pattern in dark brown, within the shell substance, and apparent only when the shell is held to the light; the pattern may consist of radial streaks, joined across in a netted pattern, or it may consist of bold chevrons; internally the shell is bluish silvery, with the large elongated spatula greyish white to yellowish brown; the margin of the shell has a continuous border in dark-brown, with terminal blotches from the internal radial pattern which also shows through faintly, back almost to the spatula.

Measurements (mm.)— (all AWBP coll.).

length	width	height	
90.0	77.0	33.0	Bongao, Sulu Archipelago
79.0	67.0	27.0	Melanesia
73.5	64.0	18.0	Lubang, Philippines
65.0	56.0	15.0	Raga, New Hebrides
53.0	43.0	14.5	Bataani, Philippines
30.5	24.5	6.5	near Noumea, New Caledonia

Plate 132. Fig. 1. *Cellana testudinaria* (Linnaeus), Java. Radula, from Adam & Leloup, Mem. Mus. Roy. D'Hist. Nat. Belg., vol. 2 (19), p. 12. Fig. 2. Lateral tooth of *Cellana vittensis* Powell (new name), Fiji. Fig. 3. Lateral tooth of *Cellana garconi* (Deshayes), Nossi Bé, Madagascar.

Radula—All teeth long and narrow; paired

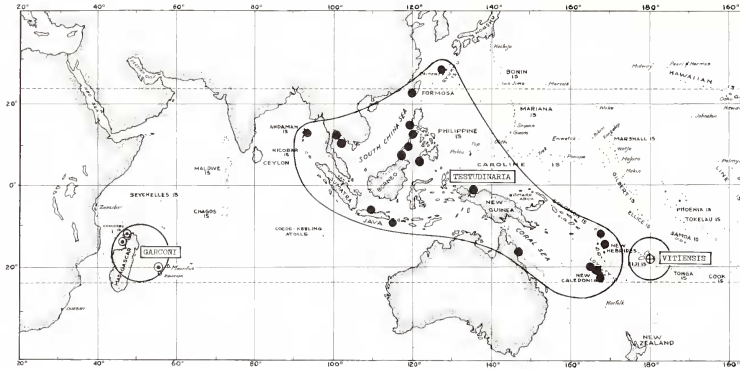


Plate 133. Geographical distribution of *Cellana testudinaria* (Linnaeus), *Cellana garconi* (Deshayes) and *Cellana vitiensis* Powell (new name).

centrals each with a long slender, erect, simple-pointed cusp; paired laterals larger than the centrals, each with the cusp moderately curved, ending in a sharp point, and with a weak denticle on each side, at the base of the cusp, and at a point just above middle height of the whole tooth; marginals 3, outer two more or less fused basally, and with a rudimentary cusp on the middle one only.

Synonymy—

- 1758 *Patella testudinaria* Linnaeus, Syst. Nat., ed. 10, p. 783. Locality?
 1765 "Lepas on Patelle," Argenville, Conch. Traité Gén. Coq. de Mer, ed. 2, pl. 2, fig. P.
 1798 *Patella patera* Röding, Mus. Bolton., vol. 2, p. 8.
 1825 *Patella rumphii* Blainville, Dict. Sci. Nat., 35, p. 95.
 1854 *Patella testudinaria* Linnaeus, Reeve, Conch. Iconica, pl. 4, figs. 6 a, b.
 1866 *Patella insignis* Dunker, Verh. Zool.-bot. Gesell., Wien, p. 941.
 1868 *Patella insignis* Dunker, Fraunfeld, Reise der Novara, Zool. Moll. p. 14, pl. 2, fig. 25.
 1891 *Helcioniscus testudinaria* Linnaeus, Pilsbry, Man. Conch., vol. 13, p. 128, pl. 25, figs. 16-19.
 1891 *Helcioniscus rota* var. *discrepans* Pilsbry, Man. Conch., vol. 13, p. 146, pl. 72, figs. 78-80.
 1906 *Helcioniscus mestayerae* Suter, Trans. N. Z. Inst., vol. 38, p. 322, pl. 18, figs. 7-9. "Stewart Island, New Zealand," in error.
 1938 *Cellana testudinaria* Linnaeus, Adams & Leloup, Mém. Mus. Roy. D'Hist. Nat. Belg., vol. 2 (19), p. 10, p. 12, fig. 2 (radula).
 1959 *Cellana testudinaria* Linnaeus, Oyama & Takemura, Moll. Shells, vol. 3, *Patella-Cellana*, pl. 1, figs. 7-10.

Types—The figured holotype and the paratype of *discrepans* are in the Academy of Natural

Sciences of Philadelphia, and the holotype of *mestayerae* is in the Dominion Museum, Wellington, New Zealand.

Records—ANDAMAN ISLANDS: Port Blair (AWBP coll.). INDONESIA: Java, Ambon, Bali (Adam and Leloup, 1938). SABAH (BORNEO): Marudu Bay, on surf washed rocks at mid to low tide (USNM). NEW GUINEA: Samberbaba, Japen Island (ANSP. Exped. 1956: ANSP). GULF OF SIAM, Koh Chang (USNM); Koh Kut (USNM). SULU ARCHIPELAGO; Bongao Islands (USNM). PHILIPPINES: west coast, Palau Island, Luzon (USNM); Marivales, Bataan, Luzon (du Pont-Acad. Exped. 1955: ANSP); Iba, Zambales, Luzon (du Pont-Acad. Exped. 1955: ANSP); Janelo Bay, Luzon (USNM); Port Tilig, Lubaang (USNM); Gignoto, Catanduanes Island (du Pont-Acad. Exped. 1955: ANSP); Cuyo Island, Palawan (ANSP). TAIWAN (FORMOSA); (USNM). RYUKYU ISLANDS (USNM); Nase, Okinawa (AWBP coll.). BANKS ISLANDS: Vanuava (AWBP coll. 186). SANTA CRUZ ISLANDS: Vanikoro (A. T. Pycroft, 1932, Auck. Mus.). NEW HEBRIDES: Lamap, Mallicolo Island (ANSP); Steepcliff Bay, Pentecost, Raga (AWBP coll.); Aoba (AWBP coll.); Gau (A. T. Pycroft, 1932, Auck. Mus.); Vureas (A. T. Pycroft, 1932, Auck. Mus.). NEW CALEDONIA; Baie des Primes near Noumea (G. & M. Kline, 1958: ANSP); near Amos, N. E. coast, under smooth basalt boulders, in caverns (L. Price, 1969). AUSTRALIA: Queensland: Cairns (AWBP coll.).

Cellana vitiensis Powell new name

(Pl. 129, figs. 1, 2; Pl. 132, fig. 2)

Range—Fiji Islands.

Remarks—Unfortunately the name *Patella sagittata* Gould, 1846, is preoccupied by the same combination used by Donovan, 1820, in Rees' Encyclopaedia of Conchology. Donovan's "*P. sagittata*" appears in the encyclopaedia against a rather crude figure at the top left of plate 10 in volume 5, and according to Dr. J. D. Taylor of the British Museum (Natural History) there ap-

pears to be no other reference to the name in the text. Nevertheless Donovan's name qualifies as validly published, and a new name for Gould's species becomes necessary since no substitute name for the apparently endemic Fijian species is available.

The Fijian species has often been mistaken for the young of *testudinaria*, but examples of that species of comparable size are more elongate, of greater solidity, lie perfectly flat, the radial sculpture is weaker and it does not develop granules. A constant feature of *vitiensis* is the anterior and posterior concavities of the shell margin, so that when the shell is placed upon a flat surface it can be rocked in a fore and aft motion.

The large *Cellana testudinaria* does not seem to occur in Fiji, or elsewhere east of there.

Description—Shell rather small, up to 39 mm. (1½ inches) in length but usually much smaller, of light build, broadly ovate, and of rather low profile, the apex at about the anterior fourth, and inclined forward; margin thin and sharp, without crenulations. There is a broad but slight concavity in the shell margin both anteriorly and posteriorly, and laterally the margin is slightly broadly convex. Sculpture crisp and delicate, consisting of densely-packed linear-spaced radials, all of which are closely granulose. Colour of exterior dark-brown to bluish black, obscurely rayed with pale blue-green tessellations. When held to the light there is an inner pattern of dark reddish brown, composed mainly of anastomosing chevrons. Interior leaden-silvery, with a very narrow blackish margin, and chestnut spatula, often with ill-defined outlines.

Radula—Similar to that of *garconi* but the top of the lateral is longer and less arched.

Measurements (mm.)—

length	width	height	
37.0	32.00	9.0	Fiji
33.5	30.75	11.0	Viti Levu Bay, Fiji
30.0	26.00	7.5	Viti Levu Bay, Fiji

Synonymy—

- 1846 *Patella sagittata* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 148 (non Donovan, 1820).
 1852 *Patella sagittata* Gould, U. S. Explor. Exped., vol. 12, p. 337, pl. 29, figs. 449 a-c.
 1891 *Helcioniscus sagittatus* Gould, Pilsbry, Man. Conch., vol. 13, p. 130, pl. 65, figs. 89-92.

Types—Holotype and three paratypes in the United States National Museum, Washington; USNM. 5839.

Records—FIJI (type locality); "Mbega"=Beqa Island ANSP; Viti Levu Bay, N. E. Viti Levu Island, on smooth dark lava rock in the upper tidal zone (W. O. Chernohorsky coll.).

Cellana grata (Gould, 1859)

(Pl. 67, fig. 7; Pl. 134)

Range—Japan and Korea.

Remarks—This common Japanese limpet has often appeared in the literature under the name of *eucosmia* Pilsbry, 1891, which name was first applied to a Red Sea shell, and then later misapplied by Pilsbry, 1895, exclusively to a Japanese *Cellana*. This latter *Cellana* is a synonym of *stearnsii* Pilsbry, 1891, which is a more strongly sculptured form of the false '*eucosmia*' of Pilsbry, 1895. However, *stearnsii* also, must be relegated to the synonymy of *grata* Gould, 1859, which becomes the valid name for this Japanese shell. Gould's *grata* is easily recognised by its rather narrowly ovate outline, high profile, and prominent sculpture of numerous scaly to tubercled radial ribs. The exterior of the shell is greyish, with dashes and speckles in light to dark reddish-brown. These intermittent radial maculations show strongly in the interior, which also has a clear cut spatula of reddish chestnut, deepening to dark-brown at the edges.

Description—Shell of moderate to fairly large size, 30-56 mm. (1½-2¼ inches) in length, ovate to

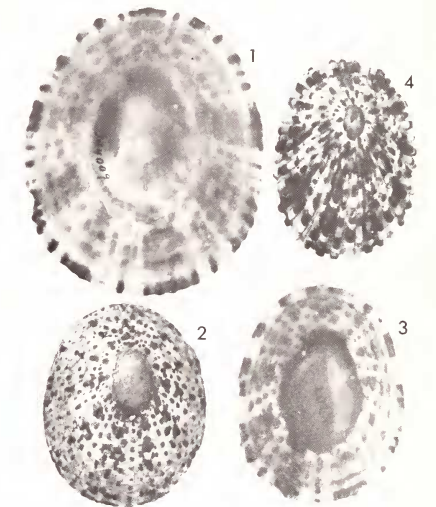


Plate 134. *Cellana grata* (Gould, 1859), Japan. Fig. 1. Suwanosejima, Osumi, 56 mm., USNM 344009. Figs. 2, 3. Nagoya, Kii, 35 and 35.5 mm., AWBP coll. 20276. Fig. 4. Tosa, 34.5 mm. (*stearnsii* form), AWBP coll. 234298.

rather narrowly ovate and moderately elevated, with both anterior and posterior slopes, slightly to conspicuously arched. Sculpture consisting of very numerous scaly to imbricately tuberculose radial ribs which are variable in development; the form *stearnsii* having optimum coarse ribbing. Colour of exterior whitish to dull gray, maculated with reddish brown spots and dashes; interior bluish grey or buff, heavily radially maculated with intermittent dark-brown rays and spots, the spatula bright-chestnut in the middle, but deepening to a dark-brown clear-cut outer edge.

Measurements (mm.)—

length	width	height	
56.0	47.0	27.0	Suwanosejima
50.5	40.5	28.0	Matsushima Id., Korea
38.0	29.0	21.0	holotype of <i>stearnsii</i> , Kii
34.0	25.0	16.0	Tosa, Japan
30.0	24.0	14.0	lectotype of <i>grata</i> ; USNM 1965.
30.0	23.0	11.5	Misaki, Japan

Synonymy—

- 1859 *Patella grata* Gould, Proc. Boston Soc. Nat. Hist., vol. 7, p. 161.
 1891 *Patella (Helcioniscus) stearnsii* Pilsbry, The Nautilus, vol. 4, p. 100.
 1891 *Patella grata* Gould, Pilsbry, Man. Conch., vol. 13, p. 135 (unfigured).
 1891 *Helcioniscus stearnsii* Pilsbry, Manual Conch., vol. 13, p. 132, pl. 48, figs. 16-18.
 1895 *Helcioniscus stearnsii* Pilsbry, Cat. Marine Moll. Japan, p. 112, pl. 7, figs. 4-6.
 1895 *Helcioniscus cucosinus* Pilsbry (non Pilsbry, 1891), Cat. Mar. Moll. Japan, p. 112, pl. 7, figs. 7-10.
 1959 *Cellana cucosmia* Pilsbry, Oyama & Takemura, Moll. Shells, vol. 3, *Cellana*, pl. 3, figs. 1-3.
 1959 *Cellana stearnsii* Pilsbry, Oyama & Takemura, Moll. Shells, vol. 3, *Cellana*, pl. 3, figs. 4-6.
 1961 *Patella grata* Gould, Johnson, Bull. 239, U. S. Nat. Mus. p. 86, pl. 19, figs. 1, 3 (lectotype).
 1962 *Cellana lucosmia* Pilsbry, Kira, Col. Illust. Shells of Japan, pl. 5, fig. 10.
 1962 *Cellana dorsuosa* forma *stearnsii* Pilsbry, Habe, Col. Illust. Shells of Japan, pl. 3, fig. 3.
 1967 *Cellana grata* Gould, Habe & Kosuge, Standard Book Jap. Shells in colour, pl. 3, figs. 4, 5.

Types—Lectotype of *grata*, selected by Johnson (1961), in the United States National Museum; USNM 1965. Type series of *stearnsii* in the Academy of Natural Sciences of Philadelphia.

Records—JAPAN: north shores of Niphon (lectotype of *grata*); Kii Province (types of *stearnsii*); Nagoya, Kii (AWBP coll.); Tosa (ANSP); Suwanosejima, Osumi (USNM); Kominato, Kazusa (AWBP coll.); Minoshima (AWBP); Misaki (ANSP). KOREA; Matsushima Island (USNM).

Cellana mazatlandica (Sowerby, 1839)

(Pl. 67, figs. 17, 18; Pl. 135)

Range—Bonin Islands, Northwest Pacific Ocean.

Remarks—This very large but comparatively thin-shelled *Cellana* seems to be restricted to the Bonin Islands. It is easily recognised by its tall conical shape, with straight dorsal slopes, conspicuous spinose radial ribs, pale yellowish brown exterior, sparsely speckled with black, and rich chestnut-brown spatula, within.

Unfortunately the well known name for this striking member of the Japanese fauna, *nigrisquamata*, has to fall as a synonym of *Patella mazatlandica*, a misnomer, since the species does not occur in the tropical West American fauna. Also Pilsbry's *Patella (Helcioniscus) boninensis* is another synonym, being merely the adult of the species.

Description—Shell reaching a large size, up to 90 mm. (3½ inches) in length, solid but not massive, of moderate height to tall conical, with almost straight slopes; apex anterior third to sub-central. Sculpture of strong, sharply raised, prominently tubercled radial ribs; about 38 primary ribs and a varying number of secondary ribs, making a total of between 48 and 55. Colour of exterior pale yellowish brown, deepening towards the margin, the radials with scattered black spots;

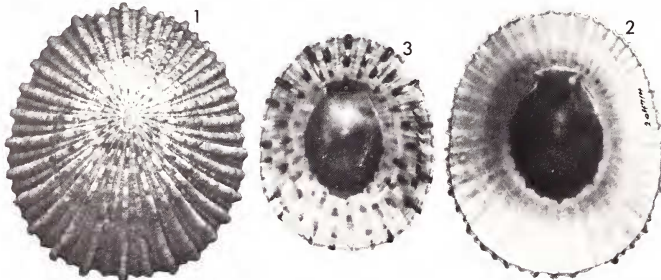


Plate 135. Figs. 1-3. *Cellana mazatlandica* (Sowerby, 1839). Chichii Jima, Bonin Islands, Japan. Fig. 1. 61 mm.; Fig. 2.

75 mm.; Fig. 3. 37 mm., AWBP coll. 204714 (better known as *boninensis* Pilsbry, 1891).

interior silvery-gray to cream, or pinkish white, with the spatula deep chestnut-brown, sometimes partly clouded with white callus; crenulated margin tinged with orange-brown.

Measurements (mm.) (all A.W.B. Powell coll.)—

length	width	height	
90.0	75.0	37.0	Bonin Islands
78.6	64.4	44.0	Bonin Islands
61.0	51.0	26.0	Bonin Islands
45.0	39.0	21.5	Bonin Islands

Synonymy—

- 1839 *Patella mazatlanica* Sowerby, Beechey's Voy. "Blossom", Zool. p. 148, pl. 39, fig. 12. "Mazatlan" in error.
 1854 *Patella nigrisquamata* Reeve, Conch. Icon. pl. 2, figs. 3 a, b. "Australia", in error.
 1891 *Patella (Helcioniscus) boninensis* Pilsbry, The Nautilus, p. 79, Bonin Islands.
 1891 *Helcioniscus boninensis* Pilsbry, Man. Conch. vol. 13, p. 131, pl. 66, figs. 1, 2, pl. 67, fig. 3.
 1891 *Helcioniscus nigrisquamatus* Reeve, Pilsbry, Man. Conch. vol. 13, p. 125, pl. 19, figs. 35, 36, pl. 48, figs. 13-15. (Concepcion, Chile", in error.
 1895 *Helcioniscus nigrisquamatus* Reeve, Pilsbry, Cat. Mar. Moll. Japan, p. 112, pl. 7, figs. 1, 2.
 1895 *Helcioniscus nigrisquamatus boninensis* Pilsbry, Cat. Mar. Moll. Japan, p. 112, pl. 7, fig. 3.
 1952 *Cellana nigrisquamata* Reeve, Kuroda and Habe, Check List Rec. Mar. Moll. Japan, p. 44.
 1959 *Cellana nigrisquamata* Reeve, Oyama and Takemura, The Moll. Shells, vol. 3, *Cellana*, pl. 3, figs. 9-12.

Records—BONIN ISLANDS: Ogasawara Island (ANSP); Chichi Jima (USNM).

Types—Three syntypes of *Patella nigrisquamata* Reeve, 1854, are in the British Museum (Natural History).

Cellana nigrolineata (Reeve, 1854)

(Pl. 67, figs. 15, 16; Pl. 137)

Range—Japan, common and widespread.

Remarks—This very attractive species is easily recognised by the orange-stained spatula and by the intricate external pattern of reddish brown

radial ribs and concentric growth lines on a greenish blue ground.

Description—Shell large, up to 78 mm. (3 inches) in length, but usually only about two-thirds that size, ovate, with an almost smooth margin, broadly rounded in profile, depressed to rather tall in fully-grown examples, with the apex varying between the anterior third and subcentral. Sculpture consisting of slightly raised, narrow radial ribs, crossed by weak concentric growth lines; between 50 and 60 radials, including intermediates, in fully adult shells. Colour distinctive; externally greenish blue, with the radial ribs and concentric growth lines picked out in reddish brown, or occasionally in black; internally, bluish silvery, with the external rib pattern showing through; spatula ivory-white but more or less stained orange-red, or sometimes dark-chocolate.

Measurements (mm.)—

length	width	height	
78.0	66.0	29.5	Chiringshima, Japan
58.0	53.5	16.5	Fukura Awaji, Japan
56.5	45.5	20.0	Chiringshima, Japan
48.5	36.5	13.0	syntype, British Museum
42.0	32.0	14.5	Nagasaki, Japan

Synonymy—

- 1854 *Patella nigro-lineata* Reeve, Conch. Iconica, pl. 18, figs. 43 a, b. "Island of Caniguing, Philippines", probably in error.
 1891 *Helcioniscus nigrolineatus* Reeve, Pilsbry, Man. Conch., vol. 13, p. 133, pl. 13, figs. 48, 49; pl. 14, figs. 71-74.
 1895 *Helcioniscus nigrolineatus* Reeve, Pilsbry, Cat. Mar. Moll. Japan, Detroit, p. 113.
 1952 *Cellana nigrolineata* Reeve, Kuroda and Habe, Check List Rec. Moll. Japan, p. 44.
 1959 *Cellana nigrolineata* Reeve, Oyama and Takemura, The Moll. Shells, vol. 3, *Patella-Cellana*, pl. 1, figs. 5, 6.
 1962 *Cellana nigrolineata* Reeve, Kira, Shells West. Pacific in Colour, p. 7, pl. 6, fig. 4.

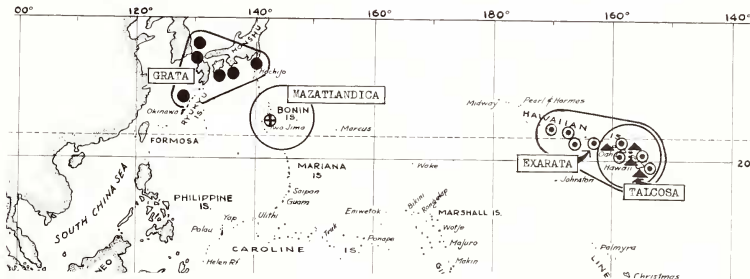


Plate 136. Geographical distribution of *Cellana grata* (Gould), *Cellana mazatlanica* (Sowerby), *Cellana exarata* (Reeve) and

Cellana talcosa (Gould).

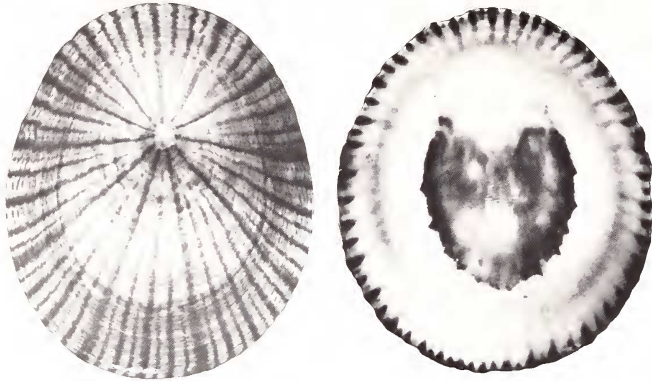


Plate 137. *Cellana nigrolineata* (Reeve, 1854), Chirungashima, Japan, 57.78 mm., AWBP coll. 52754.

Types—Four syntypes in the British Museum (Natural History), of which one, measuring 47.0 X 37.75 X 11.5 mm., is probably the one figured by Reeve, and this I now nominate as lectotype.

Records—Philippines, Island of Caniguing"=Caniguan (type locality; probably in error); JAPAN: Hirado, Nagasaki Prefecture (Oyama and Takenura, 1959); Chirungashima (AWBP coll.); Fukura Awaji (USNM); Sagami Bay (Bishop Mus.); Manazutu (Auck. Mus.); Mimosima, Wakayama (AWBP coll.).

Cellana toreuma (Reeve, 1855)

(Pl. 138)

Range—Japan to Ryukyu Islands, Mariana Islands, Taiwan, Hongkong, China, and Philippines.

Remarks—There is little doubt that *toreuma* and *amussitata* represent extremes in sculptural development of a single species. Ino (1935, p. 31) has shown how size, rib-strength, outline, and other variations, can be accounted for by position in the tidal zone, nature of the substratum, and degree of exposure to wave stress.

The predominant form of the species is long and narrow with subparallel sides, and internally, the spatula is long and narrow also. Certain shells from the Philippines (Plate 71, figs. 7, 8)

are broadly ovate, but these are extreme individuals in populations that have narrow shells as well. Pilsbry's *Helcioniscus nigrolineatus* var. *divergens* is still another variant of *toreuma*, which is of large size, elongate-ovate, but with rounded rather than subparallel sides, and dense, fine, subgranose radial sculpture (Plate 71, fig. 6). Rugosely sculptured shells (Plate 71, fig. 3) are, according to Ino, found towards low water, where rocks have rough surfaces, contrasted with rock surfaces from higher levels that have been smoothed by erosion.

Description—Shell of moderate size, up to 40 mm. (1½ inches) in length, lightly built, very depressed, apex between the anterior third and fourth, elongate-ovate, narrow, with flattened sides, and tapered to a narrowly rounded front margin; margins weakly crenulated. Sculpture variable, typically consisting of 30-40 moderately strong, narrow, sharply raised primary radial cords, and from 1-3 secondary cords in each interspace, the whole crossed by fine sharp growth lines, that weakly decussate the radial cords, especially the secondary ones. Colour extremely variable; externally, usually greenish or buff, boldly rayed, mottled and blotched with dark reddish brown; internally bluish silvery, the external pattern showing through strongly; spatula ill defined, usually diffused chestnut-brown, but white callused at the anterior end.

Measurements (mm.)—

length	width	height	
40.0	31.0	9.0	Japan; Pilsbry, 1891, p. 135
39.5	28.5	5.8	Nagasaki
36.25	25.0	5.5	Waki, Satsuma

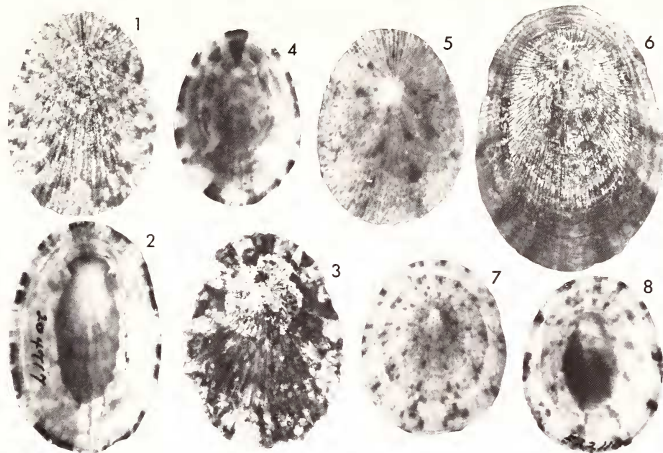


Plate 138. Figs. 1-8. *Cellana toreuma* (Reeve, 1855). Fig. 1. Nagasaki, Japan, 39 mm., AWBP coll. 48219. Figs. 2, 3. Waki, Satsuma, Japan, 37 & 35 mm., AWBP coll. 204717. Figs. 4, 5. Hongkong, 24 & 28 mm., USNM. Fig. 6.

Anatahan Island, Mariana Islands, 44.5 mm. (*-divergens* Pilsbry, 1891). AWBP coll. 232358. Figs. 7, 8. Malibon, near Manila, Philippines, 35 & 29 mm., USNM 522110.

Synonymy—

- 1855 *Patella toreuma* Reeve, Conch. Iconica, pl. 27, figs. 69 a-c.
 1855 *Patella amussitata* Reeve, Conch. Iconica, pl. 30, figs. 83 a, b.
 1855 *Patella affinis* Reeve, Conch. Iconica, pl. 35, figs. 108 a, b.
 1855 *Patella toreuma* var. *tenuilirata* Carpenter, Proc. Zool. Soc. Lond. "Monterey," in error.
 1891 *Helcioniscus toreuma* Reeve, Pilsbry, Man. Conch., vol. 13, p. 135, pl. 13, figs. 50-53.
 1891 *Helcioniscus nigrolineatus divergens* Pilsbry, Man. Conch., vol. 13, p. 134, pl. 73, figs. 81-84.
 1895 *Helcioniscus toreuma* Reeve, Pilsbry, Cat. Mar. Moll. Japan. Detroit, p. 113.
 1925 *Patella affinis*: (synonym of *toreuma*), Tomlin and Peile, Proc. Malac. Soc. Lond., vol. 16, p. 198.
 1925 *Patella amussitata* Reeve, (synonym of *toreuma*), Tomlin and Peile, Proc. Malac. Soc. Lond., vol. 16, p. 198.
 1935 *Cellana toreuma* Reeve, Ino, Bull. Jap. Soc. Sci. Fisheries, no. 37, pp. 31-36.
 1952 *Cellana amussitata* Reeve, Kuroda and Habe, Check List Rec. Mar. Moll. Japan, p. 44.
 1952 *Cellana toreuma* Reeve, Kuroda and Habe, Check List Rec. Mar. Moll. Japan, p. 44.
 1959 *Cellana toreuma* Reeve, Oyama and Takenura, The Moll. Shells, vol. 3, *Cellana*, pl. 2, figs. 9-12.
 1959 *Cellana amussitata* Reeve, Oyama and Takenura, The Moll. Shells, vol. 3, *Cellana*, pl. 2, figs. 13, 14.
 1942 *Cellana amussitata* Reeve, Yen, Proc. Malac. Soc. Lond., vol. 24, p. 174, pl. 11, fig. 1.

Types—The types of *affinis*, *amussitata* and *toreuma* all of Reeve, 1855, are in the British Museum (Natural History), and that of *divergens*

Pilsbry, 1891 is in the Academy of Natural Sciences of Philadelphia. The type locality for *toreuma* cited by Reeve as "Monterey, California," is erroneous.

Records—CHINA: (ex Cuning, Brit. Mus. (N. H.)). JAPAN: Nagasaki (USNM); Waki, Satsuma, Futami, Hyogo. MARIANA ISLANDS: Anatahan Island (all AWBP coll.). HONGKONG (USNM). TAIWAN: (Oyama and Takenura, 1959, pl. 2, figs. 9-14). PHILIPPINES: Malibon, near Manila (USNM).

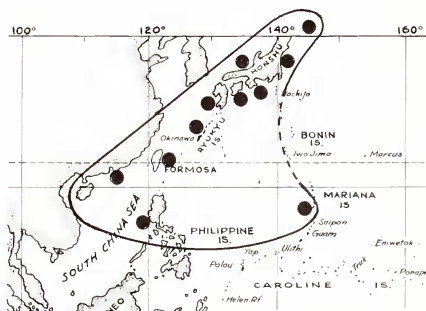


Plate 139. Geographical distribution of *Cellana toreuma* (Reeve).

***Cellana exarata* (Reeve, 1854)**

(Pl. 67, figs. 4-6; Pl. 140)

Range—Hawaiian Islands.

Remarks—This well-known Hawaiian limpet is readily distinguished, when not in an eroded state, by its high-conical shape, with straight dorsal slopes, and black external ribbing, with narrow whitish interspaces. Internally the coloration is silvery to bluish leaden, and the clear-cut spatula is leaden to black, except when clouded with white callus.

Dr. Alison Kay (1969, pp. 1, 2) advocated separation of *exarata* into three distinct species, diagnosed as follows:—

- (1) *exarata*—Shell black, finely sculptured, the radial ribs not extending beyond the margin; foot of animal dark grey, mantle almost black; mantle appendages short, extending only 5 mm. beyond the edge of the shell. It belongs to the splash zone, on the islands of Oahu, Molokai, Maui and Hawaii.
- (2) *sandwichensis*—Shell black, coarsely sculptured, the radial ribs extending beyond the margin; foot of animal yellow, mantle grey;

mantle appendages long, some extending 20 mm. beyond the edge of the shell. It belongs to the low tidal zone, over the same range of localities where *exarata* is found.

- (3) *melanostoma*—Shell cream or white, with brown ribs; foot of animal and the mantle bright green. Outlying locations of the Hawaiian Chain, Necker, Nihoa, Lehua, Gardner Pinnacles and parts of Kauai.

After examining the excellent range of *exarata* material in the Bishop Museum, plus extensive material representative of the locations listed following, the writer is of the opinion that *sandwichensis* and *melanostoma*, so far as present evidence goes, do not qualify for higher status than ecotypes of *exarata*.

The juvenile stage, up to 24 mm. in length, in all three forms is identically tessellated in black and white, after which the radial ribs become continuously black, unless defaced by erosion. Most material from the outlying shoals and pinnacles of the Hawaiian Chain is subject to erosion, which reduces the surface of the adult shell to a uniform cream or white. However, in one lot from French Frigate Shoal, several

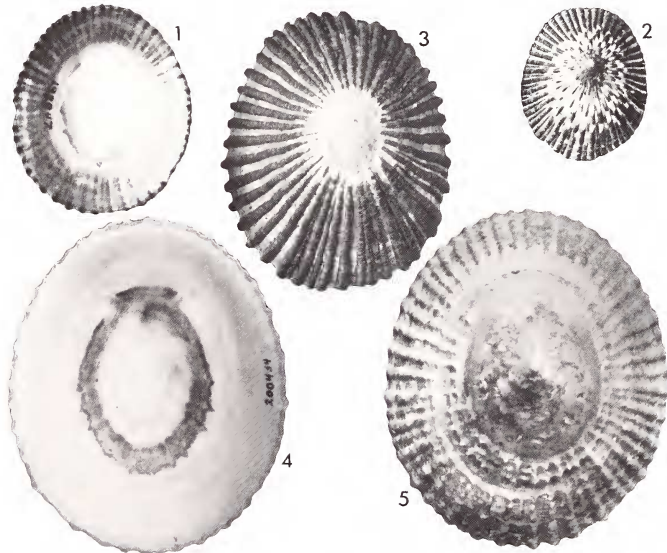


Plate 140. Figs. 1-5. *Cellana exarata* (Reeve, 1854), Hawaiian Islands. Figs. 1, 3. Kau Waialukiini, Hawaii, 47-53 mm., AWBP coll. 198947. Fig. 2. Hilo, Hawaii, 35 mm., AWBP

coll. 195871. Figs. 4, 5. Gardner Pinnacles, 83 mm., AWBP coll. 200434.

adults have retained the black pigmented ribs right through to the fully adult shell.

Regarding differences in the coloration of the animal and in the relative lengths of the mantle appendages recorded by Dr. Kay, the writer has found similar variations in the New Zealand *Cellana radians*, which has a vertical range extending from low water to the lower edge of the splash zone. In the case of *exarata* versus *sandwichensis* it would be interesting to have observations upon limpet animals from mid-tidal locations.

The eroded *melanostoma* form of *exarata* is strikingly similar to *mazatlanica* of the Japanese Bonin Islands, and there is little doubt that there is near relationship. The Bonin species has a tessellated juvenile stage also, but the ribbing in the adult stage is tubercular and not continuously coloured, just sparsely speckled, and the apatula is deep chestnut-brown, not leaden to black, as it is in *exarata*.

Description—Shell reaching a large size, up to 83 mm. (3¼ inches) in length, but usually between 45 and 60 mm., solid, but not massive, narrowly ovate, with a subcentral nucleus, and conical with straight sides. Sculpture consisting of from 46 to 50 bold, sharply raised, flat-topped radials, that are smooth, except were crossed by weak concentric growth striae; margin shallowly corrugated to deeply indented by square-cut crenulations. Colour of exterior consisting of plain black radial ribs, with grey or whitish interstices, the apical area only, tessellated with black and

white dashes; internally silvery to bluish-lead, with the dark ribbing showing through; spatula leaden to solid black, but often partly or completely white callused. When the shell is eroded externally that surface becomes whitish or cream coloured, and the corresponding interior is usually diffused with yellow or orange-brown.

Measurements (mm.) (all AWBP coll.)—

length	width	height	
83.0	68.5	40.0	Gardner Pinnacles
70.0	58.0	34.0	Molokai Island
64.0	55.5	37.5	Necker Island
42.0	32.0	12.0	Molokai Island

Synonymy—

- 1839 *Patella exarata* Nuttall, in Jay, Cat. Shells, 3, p. 38 (nomen nudum). "Oregon, California," in error.
 1854 *Patella exarata* Reeve, Conch. Iconica, pl. 19, figs. 47 a, b.
 1854 *Patella undato-lirata* Reeve, Conch. Iconica, pl. 23, figs. 59 a, b. "Sandwich Islands."
 1860 *Patella sandwichensis* Pease, Proc. Zool. Soc., p. 437.
 1870 *Helcioniscus exaratus* Nuttall, Dall. Amer. Journ. Conch., vol. 6 (3), p. 279, pl. 16, fig. 29 (dentition).
 1891 *Helcioniscus exaratus* Nuttall, Pilsbry, Man. Conch., vol. 13, p. 126, pl. 47, figs. 1-3; 6-12.
 1891 *Helcioniscus melanostomus* Pilsbry, Man. Conch., vol. 13, p. 151, pl. 32, figs. 67-69.
 1969 *Cellana exarata, sandwichensis* and *melanostoma*: Kay, Hawaiian Shell News, vol. 17, no. 4, pp. 1, 2.

Types—Three syntypes in the British Museum (Natural History), of which, one measuring 42.5 x 35.0 x 18.0 mm. is evidently the one figured by Reeve and this I now nominate as lectotype.

Records—HAWAIIAN ISLANDS: OAHU: Hanama Bay; Manana Islands; Mokoloa Rock; Kaena Point; Manana; Moku Manu; Poipoa Islet. HAWAII: Hilo; Kona; Kau Waia-

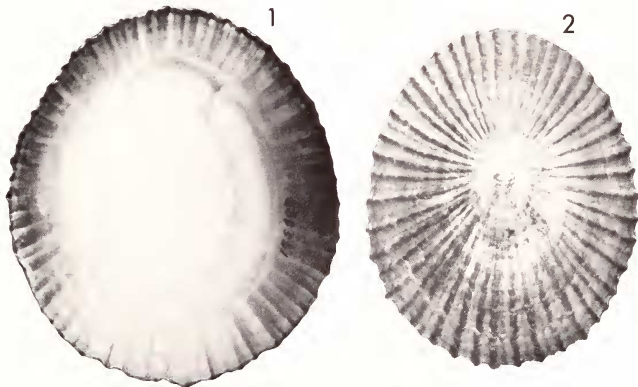


Plate 141. Figs. 1, 2. *Cellana talcosa* (Gould, 1846). Fig. 1. Molokai, Hawaiian Islands, 87 mm., AWBP coll. 195887. Fig. 2. Hawaiian Islands, 56.5 mm., AWBP coll. 22915

(better known under its preoccupied name, *argenteata* Sowerby, 1839).

hokini. KAUAU: Haena. MAUI: West Honolua. MOLOKAI: Kamakokai (all Bishop Mus.). LA PEROUSE PINNACLE. (Tanager Exped., Bishop Mus.). GARDNER PINNACLES (Tanager Exped., Bishop Mus.). NECKER (Tanager Exped.). NIIHOA (Tanager Exped. Bishop Mus.).

Cellana talcosa (Gould, 1846)

(Pl. 67, fig. 3; Pl. 141)

Range—Hawaiian Islands.

Remarks—This very large species of Hawaiian *Cellana*, long known as *Patella argentata* Sowerby, 1839, must take the name of *talcosa* Gould, 1846, owing to the prior *Patella argentata* Bosc, 1801.

Apart from large size, *talcosa* is distinguished by its nearly circular outline, broadly rounded, high-arched profile, very numerous, rather regular, radial ribs, and distinctive coloration, the exterior, when not encrusted, being reddish chestnut, and the interior silvery, with the scapula and surrounding muscle impression white. This species is found on exposed rocky shores and outer reefs near the low tide line.

Description—Shell solid, very large, up to 106 mm. (4½ inches) in length, broadly ovate, almost circular in outline, and roundly low-conical in profile, with the apex subcentral. Sculpture consisting of very numerous, narrowly rounded radial ribs, 58-76 primary, and a few secondary riblets in the interspaces of the lower half of the shell; margins finely crenulated. Colour, externally reddish chestnut, but almost invariably encrusted with algae and limy deposit; internally with a large ivory-white spatula, surrounded by a white callused area, and from there to the margin silvery, with the chestnut ribbing of the exterior showing through, especially towards the margin.

Measurements (mm.)—

length	width	height	
106.5	94.0	45.0	Kona, Hawaii
88.0	81.5	33.0	Molokai
87.0	81.0	37.5	Molokai

Synonymy—

- 1839 *Patella argentata* Sowerby in Beechey's Voy. "Blossom," Zool., p. 148, pl. 39, fig. 12 (non Bosc, 1801), "Valparaiso, Chile," in error.
 1846 *Patella talcosa* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 148. Hawaii, Sandwich Islands.
 1852 *Patella talcosa* Gould, U. S. Explor. Exped., Moll. p. 334, pl. 29, figs. 452 a, b.
 1854 *Patella cuprea* Reeve, Conch. Iconica, pl. 8, figs. 15 a, b, "Swan River," erroneous.
 1891 *Heliciniscus argentatus* Sowerby, Pilsbry, Man. Conch., vol. 13, p. 127, pl. 18, figs. 29, 30; pl. 65, fig. 93.
 1969 *Cellana talcosa* Gould, Kay, Hawaiian Shell News, vol. 17, no. 4, p. 1.

Types—The holotype of *talcosa* is in the United States National Museum, Washington (USNM. 5824).

Records—HAWAIIAN ISLANDS: HAWAII: South Point, Kaulaia; Kona; Kau, Waikapuna; Puako. KAUAU: Koloa; MAUI: Haena, Honolua, Keoneia (all Bishop Mus.). MOLOKAI: outer reefs (AWBP coll.). NIIHOA (Bishop Mus.). There seem to be no recent records of the species from the island of Oahu, but it occurs there fossil in raised coral reef formations.

Cellana taitensis (Röding, 1798)

(Pl. 75)

Range—Tahiti, Society Islands, and Pitcairn Island.

Remarks—This rather small-sized *Cellana* is lightly built, of ovate outline, moderately elevated, closely and rather regularly radially ribbed, and of dull greenish colour, maculated with numerous intermittent radial dark-brown lines and blotches. It is possibly closely allied to the Lord Howe Island *analogia* Iredale.

The writer is indebted to Dr. Harald A. Rehder of the National Museum of Natural History, Smithsonian Institution, Washington, for pointing out (personal communication) Röding's earlier name for the well known *tahitensis* (Pease). Röding's *Patella taitensis* was cited as coming from 'Othahaité' (= Tahiti), and was based upon Favanne, tab. 1, figs. N, N. Despite the crudeness of Favanne's illustrations, they suggest the common *Cellana* of Tahiti rather than *Patella (Scutellastra) flexuosa*, the only other patellid limpet known to occur in the Society Group.

Description—Shell small, 33.5 mm. (1½ inches) in length, but usually smaller, of light build, broadly ovate, moderately elevated, and with the apex at about the anterior third; margin thin, minutely crenulated. Sculpture consisting of very

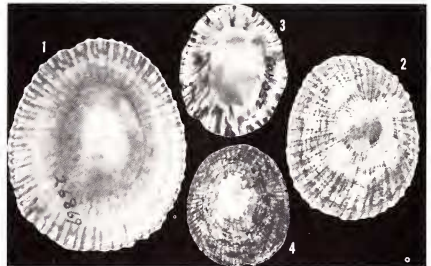


Plate 142. Figs. 1-4. *Cellana taitensis* (Röding, 1798). Figs. 1, 2, Pitcairn Island, 25-30 mm., AWBP coll. 26869. Figs. 3, 4, Tautira, Tahiti, 24-25 mm., AWBP coll. 250703.

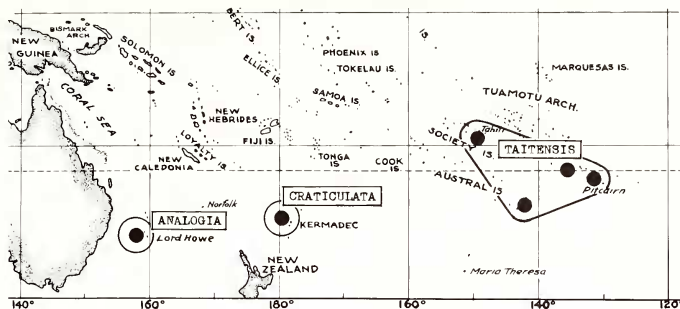


Plate 143. Geographical distribution of *Cellana analogia* Iredale, *Cellana craticulata* (Suter) and *Cellana taitensis* (Röding).

numerous, moderately strong, narrow, radial riblets that are deeply cut by closely-spaced concentric growth lines, resulting in nodulation, especially towards the margin. Colour: externally, varying from dull greenish to greenish white, with a variable radiate pattern in dark-brown, ranging from intermittent radial lines to bold blotches; internally, iridescent dull dark bluish grey, the terminal points of the external ribbing forming a narrow dark border; spatula dark greyish or greenish brown, sometimes clouded with white callus.

Measurements (mm.)—

length	width	height	
33.5	27.00	11.50	Tautira, Tahiti
29.0	25.00	14.00	Pitcairn
26.0	21.75	8.75	Tautira, Tahiti
18.0	15.00	6.00	Tautira, Tahiti



Plate 144. *Cellana ardosiaea* (Hombron & Jacquinot, 1841), Island of Juan Fernandez, off Chile, 46-55 mm., AWBP

Synonymy—

- 1798 *Patella taitensis* Röding, Mus. Bolten., pt. 2, p. 7, sp. 68. Based upon Favame, tab. 1, figs. N, N.
- 1868 *Tectura tahitensis* Pease, Amer. Journ. Conch., vol. 4 (3), p. 98, pl. 11, fig. 21.
- 1891 *Helcioniscus tahitensis* Pease, Pilsbry, Man. Conch., vol. 13, p. 129, pl. 67, figs. 4-8.
- 1907 *Patella (Helcioniscus) tahitensis* Pease, Couturier, J. de Conchyl., vol. 55 (2), p. 173. (Pitcairn Island).
- 1966 *Cellana tahitensis* Pease, Rehder, Hawaiian Shell News, vol. 14 (8), p. 5. Pitcairn Island.

Records—TAHITI (type locality): S. W. of Tautira, on basalt rocks in the splash zone (R. Robertson, 22 July, 1952; ANSP). PITCAIRN ISLAND (AWBP coll.): Bounty Bay (Rehder, 1966). TUAMOTU ARCHIPELAGO: Mangareva (Aust. Mus.).

Cellana ardosiaea
(Hombron and Jacquinot, 1841)

(Pl. 73, figs. 7, 8, Pl. 144)

Range—Island of Juan Fernandez, off the coast of Chile.



coll. 48228.

Remarks—This is the furthest east yet recorded for the Indo-Pacific genus *Cellana*. Pilsbry (1891) considered *ardosiacea* to be allied to the Society Islands *taitensis*, but that is a most unlikely relationship. From all other species of *Cellana*, the Juan Fernandez shell stands apart, with its nearly circular, spreading form with its straight dorsal slopes, high conical profile, and its small, erect, nearly central apex.

Unfortunately the writer has no preserved animals of *ardosiacea*, but reference to Schuster (1913) and to Thiem (1917), respectively, leave no doubt that the species is a *Cellana*, not a *Nacella* (*Patinigera*), which latter relationship one would have expected, owing to the geographical proximity of *ardosiacea* to the South American mainland.

The epipodial fringe, so characteristic of *Nacella* and its subgenus *Patinigera*, is absent in *ardosiacea*, as also is any trace of the equally characteristic bronzy coloration of the shell.

Thiem (1917, p. 389) described in *ardosiacea* a presumed sensory organ, the "vorderer subpalliatore Simmestreif" (anterior subpalliatore sensory stripe), and a longer posterior one, the former evidently the same structure as Fretter and Graham's (1962, p. 118) "lateral glandular streak" in *Patella*. The anterior sensory stripe, or lateral glandular streak, was noted in several species of *Cellana*, but not the 'posterior stripe,'

which possibly, could have resulted from contraction during preservation.

Description—Shell moderately large, up to 58 mm. (2¼ inches) in length, rather solid, broadly ovate, with the small erect apex nearly central; tall-conical with the sides descending almost perfectly straight; margin smooth to weakly crenulated. Sculpture consisting of weak, evenly-spaced, radial primary cords, with 3-4 secondary cords or threads in each interspace, the whole crossed by numerous concentric growth threads. Colour of exterior light bluish olive, darker towards the margin; the apex yellowish to reddish brown; interior silvery bluish grey, except for the spatula, which is yellowish to orange-brown, and there is a narrow rim of greenish olive at the margin.

Radula—The radula, as figured by Schuster (1913, p. 304, text fig. V), is not diagnostic, since there is no basic difference between the radula of *Cellana* and that of the *Nacella* group.

Measurements (mm.)—

length	width	height	
57.5	51.5	23.0	all Juan
57.5	52.0	21.5	Fernandez
55.0	46.0	20.5	Island
46.0	39.0	17.0	
37.0	32.5	14.5	

Synonymy—

- 1841 *Patella ardosiaeca* Hombron & Jacquinot, Ann. Soc. Nat., vol. 2 (16), p. 190.
 1854 *Patella clathratula* Reeve, Conch. Iconica, pl. 14, figs. 30 a, b.
 1891 *Helcioniscus ardosiaecus* H. and J., Pilsbry, Man. Conch., vol. 13, p. 124, pl. 32, figs. 63-66.
 1913 *Helcioniscus ardosiaecus* H. and J., Schuster, Zool. Jahrb., Jena, Suppl. 13, pp. 281-384.
 1917 *Helcioniscus ardosiaecus* H. and J., Thiem, Zool. Naturw., vol. 54, pp. 333-404.

Records—JUAN FERNANDEZ: (Stearns coll., USNM ANSP).

***Cellana conciliata* Iredale, 1940**

(Pl. 145; Pl. 148, fig. 3)

Range—North Queensland down to Bargara, South Queensland.

Remarks—This species is easily distinguished from *tramoserica* by its very fine and dense radial sculpture, and in the adult stage by a disproportionate broadening of the posterior end. Also the radula differs from that of *tramoserica* in that all the teeth are shorter and rather stouter.

Description—Shell of moderate size, up to 40 mm. (1½ inches) in length, broadly ovate, with very weakly scalloped edges, and rather low in

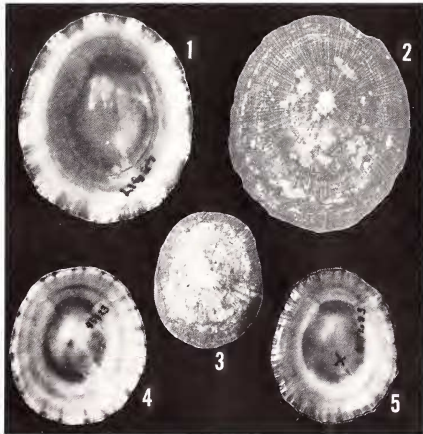


Plate 145. Figs. 1-5. *Cellana conciliata* Iredale, 1940. Figs. 1, 2. Lammermore Heads, Keppel Bay, Queensland, 35-38 mm., AWBP coll. 45417. Figs. 3-5. Keppel Bay, Queensland, 34-39 mm. (Fig. 5, marked X, compared with holotype), AWBP coll. 45423.

height, with the apex subcentral. Sculpture delicate and rather even, consisting of very numerous radial riblets, due to little difference in strength between primaries and secondaries; about 140 riblets in all. As the shell reaches mature size, it tends to gain little height but spreads posteriorly. Concentric growth lines arc weak and apparent only at the margin in adults. Colour greenish or bluish grey externally, often broadly or narrowly radially banded in dark brown, with pale chestnut lines in the interstices; young shells often uniformly dark greenish grey; silvery-blue to creamy-white within, sparsely and faintly rayed with bluish grey towards the margin; spatula fawn to dark yellowish brown, often clouded with a white callus in mature shells.

Radula—Similar to that of *tramoserica* but all the teeth are shorter and stouter than in that species (Macpherson, 1955, p. 239).

Measurements (mm.)—

length	width	height	
41.0	39.0	15.0	Keppel Bay; paratype
40.0	34.0	14.0	Keppel Bay; holotype
38.7	34.0	15.0	Keppel Bay; topotype
33.0	28.0	14.5	Keppel Bay; topotype

Synonymy—

1940 *Cellana conciliata* Iredale, Aust. Zool. 9, p. 432, pl. 33, figs. 1-3, 19, 20.

1955 *Cellana conciliata*. Macpherson, Proc. Roy. Soc. Vict., vol. 67 (2), p. 238, pl. 10, figs. 1, 2.

Types—Holotype and paratypes in the Australian Museum, Sydney; paratypes and topotypes in Powell collection, Auckland.

Records—QUEENSLAND: Keppel Bay (type locality); Bargara, near Bundaberg (Mrs. J. Kerslake; AWBP coll.).

Cellana turbator Iredale, 1940

(Pl. 146, figs. 5-7; Pl. 148, fig. 4)

Range—Caloundra, south Queensland.

Remarks—This is a small conical species that differs from the young forms of *tramoserica* in sculpture, the radial ribbing being coarsely nodulose, in coloration, and also in the radula, as described below.

Description—Shell small, up to 18 mm. (% inch) in length, regularly ovate, with an elevated, roundly-conical, profile; apex at the anterior third. Sculpture bold, consisting of about 25 nodulose, primary, radial ribs, with a single secondary radial, almost as strong, in each interspace; margin weakly crenulated. Colour, green-

ish white externally, and creamy, pinkish, or silvery-white within; sparsely and intermittently lined and speckled with dark-brown; spatula dark chestnut, with clear outlines, or diffused with callus.

Radula—Formula 3+1+(1+0+1)+1+3. The radula is distinctive; the two central teeth are sharply pointed but have a small spur on the outer edge; the bicuspid laterals have a long inner cusp, with a prominent notch about one fourth of the way down from the tip, and a blunt conical basal cusp, rising to a third the height of the main cusp; marginals three, long and slender, the outer one the largest (Macpherson, 1955, p. 238).

Measurements (mm.)—

length	width	height	
20.0	15.5	7.0	Caloundra
18.0	14.7	5.8	Caloundra
15.0	12.0	6.0	holotype
14.5	12.0	5.0	Caloundra

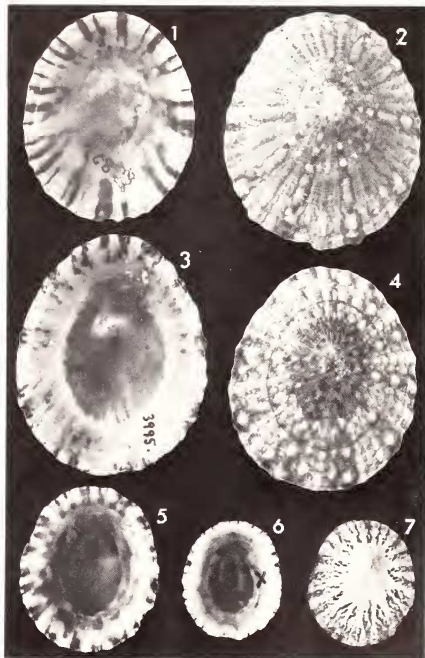


Plate 146 Figs. 1-4. *Cellana tramoserica* (Holtén, 1802). Figs. 1, 2. Mainly, New South Wales, 34 mm., AWBP coll. 3905. Figs. 5-7. *Cellana turbator* Iredale, 1940, Caloundra, Queensland, 14.5-20 mm. (One marked X, compared with holotype), AWBP coll. 4540.

Synonymy—

1940 *Cellana turbator* Iredale, Aust. Zool., vol. 9, p. 433, pl. 32, figs. 16-18.

1955 *Cellana turbator*: Macpherson, Proc. Roy. Soc. Victoria, vol. 67 (2), p. 239, pl. 10, figs. 3, 4.

Types—Holotype and paratypes in the Australian Museum, Sydney.

Records—Known only from the type locality, Caloundra, Queensland.

Cellana tramoserica (Holten, 1802)

(Pl. 73, figs. 1-3; Pls. 146-148)

Range—South Australia, Victoria, east coast of Tasmania, New South Wales and southern Queensland.

Remarks—This species is distinguished from *solida* by the more numerous, subcarinate, linear-spaced ribs, and resultant finer marginal crenulations, the variegated colour pattern, smaller adult size, and lesser solidity. The various colour forms are described below. Iredale's *sontica* from Caloundra, South Queensland, is a small rather drab-coloured form of the species, that does not merit separation. Dr. Hope Macpherson (1955, p. 238) remarked that a series covering both typical *tramoserica* and *sontica* showed that there were no radular differences between the two forms.

Description—Shell moderately large, up to 60 mm. (2½ inches) in length, broadly ovate, roundly conical with the apex subcentral, and with a finely scalloped margin. Sculpture consisting of about 36 strong, subcarinate radial ribs with narrow interstices, the whole crossed by dense, fine, sharp growth lines. Colour exceedingly variable: externally yellowish, pink, or light-brown, with some of the primary ribs dark-fawn, or chocolate, either plain or with elongated whitish patches; again, some of the ribs may be reddish, and in others the rib interstices only may be lined in dark-brown; internally the shell is often yellowish to orange, or golden nacreous, with the spatula varying from dark-fawn to a whitish callus; the margin is variously radially lined by the dark, external ribbing showing through the thinner outer edge.

Radula—Formula $3 + 1 + (1+0+1) + 1 + 3$. The pair of central teeth are long, curved and unicuspid, as in *solida*, but the pair of bicuspid laterals have a distinct notch, half way down from the tip, and there is a small conical cusp at

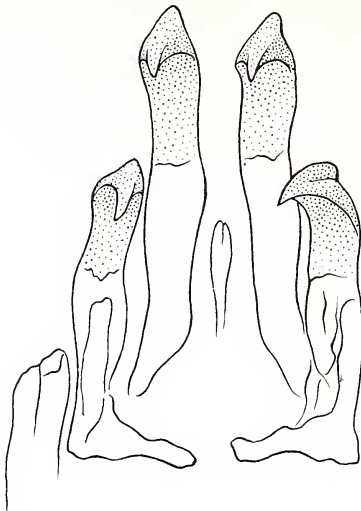


Plate 147. *Cellana tramoserica* (Holten), Alan Bay, Great Australian Bight, South Australia. Radula.

the base; of the three marginal teeth, the outer two are sharply pointed, but the inner one has the tip bent over slightly to form a blunt cutting point (Macpherson, 1955, p. 239). It is of interest that a radula from a specimen taken at Alan Bay, Great Australian Bight was four times the length of the shell.

Measurements (mm.)—

length	width	height	
59.5	48.0	28.0	Noosa Head, Queensland
54.0	46.0	24.0	Mainly, New South Wales
37.0	31.0	16.0	Long Reef, New South Wales
22.5	19.0	6.0	The Spit, Port Jackson, N.S.W.

Synonymy—

- 1802 *Patella tramoserica* Holten, Enum. Syst. Conch., Chemnitz, p. 85 (based upon Chemnitz, Conch. Cab., vol. 11, pl. 197, figs. 1912, 1913.)
- 1825 *Patella variegata* Blainville, Dict. Sci. Nat., vol. 38, p. 100.
- 1825 *Patella tramoserica* Martyn, Sowerby, Cat. Tankerville Coll., p. 30.
- 1831 *Patella jacksoniensis* Lesson, Voy. "Coquille" Zool., vol. 2 (1), p. 418.
- 1854 *Patella tramoserica* Martyn, Reeve, Conch. Iconica, pl. 13, figs. 27 a-c.
- 1891 *Helcioniscus tramoserica* Martyn, Pilsbry, Man. Conch., vol. 13, p. 142, pl. 70, figs. 49, 52.
- 1924 *Cellana variegata ariel* Iredale, Proc. Linn. Soc. N.S.W., vol. 49, p. 242.
- 1940 *Cellana sontica* Iredale, Aust. Zool., vol. 9, p. 433, pl. 33, figs. 10-12.

1955 *Cellana tramoserica* Holten, Macpherson, Proc. Roy. Soc. Victoria, vol. 67 (2), p. 237.

Records—SOUTH AUSTRALIA: Alan Bay, Great Australian Bight (I. G. Marrow); Aldinga (AWBP coll.). VICTORIA: St. Kilda; Mornington; Point Nepean (Macpherson, 1955); Port Fairy (type of *ariel*). TASMANIA: east coast, rare and small (W. L. May, 1923). NEW SOUTH WALES: Botany Bay (type locality); Long Reef; Manly; The Spit, Port Jackson; Shellharbour. QUEENSLAND: Port Douglas; Point Vernon (Mrs. J. Kerslake; AWBP coll.); Noosa Head; Stradbroke Island; Caloundra (type of *sontica*); near Brisbane (all AWBP coll.).

Cellana solida (Blainville, 1825)

(Pl. 73, figs. 4-6; Pl. 148, fig. 1; Pl. 150)

Range—Tasmania, Bass Strait Islands, and Victoria to eastern South Australia, in the algal zone of the lower littoral.

Remarks—This is a large solid limpet, sculptured with bold, rounded, radial ribs. Blainville's *solida* applies to the smaller size range of the species, and his *rubraurantiaca* to the fully adult in which the internal colour usually deepens to orange-red at the margin. A conspicuous feature

of this species is the clearly defined dark-coloured spatula, which varies from olive-brown to greenish or bluish slate.

Description—Shell large, up to 79 mm. (over 3 inches) in length, solid, broadly ovate, with a deeply scalloped margin, tall conical, with the apex varying between subcentral and the anterior third. There are about 26 strong, rounded, radial ribs, crossed by dense, sharp-edged growth lines. Colour variable with age; young shells are grey or greenish grey within, the spatula clearly defined, olive to bluish slate; becoming yellowish, and finally pale orange at the margin, where bold radiate dark red-brown radials show through the shell substance; exterior dull grey to pinkish buff, often with radiate yellowish brown streaks in the rib interstices. Fully grown examples tend to have the spatula more or less masked by a thick whitish callus, and the margin is bright reddish orange, regularly banded by the reddish brown radials. In this latter form, *rubraurantiaca*, the exterior is pinkish white.

Radula—Formula $3 + 1 + (1+0+1) + 1 + 3$. The two centrals are long, slender, curved and unicuspid; the pair of laterals are bicuspid, the main member similar to the centrals, but with a small additional cusp at the base; the three marginals are narrow and slender, the inner one curved over at the top into a cutting edge, the other two simple (Macpherson, 1955, p. 236).

Measurements (mm.)—

length	width	height	
78.5	67.0	38.0	Bass Strait
75.0	62.0	31.0	St. Helens, Tasmania
74.0	61.5	33.0	South Australia
51.0	43.5	19.5	St. Francis Id., S. Australia

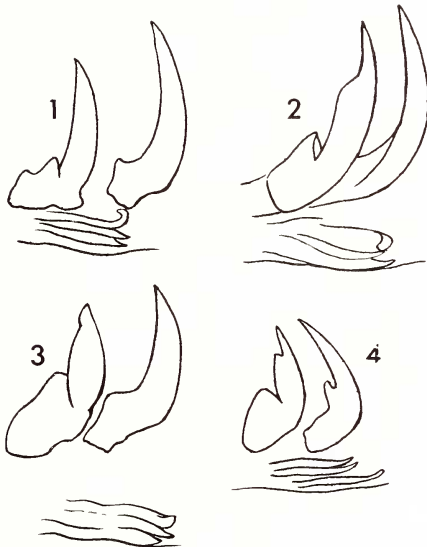


Plate 148. Radulae of Australian *Cellana* in profile; lateral tooth (left) and central tooth (right). Fig. 1. *Cellana solida* (Blainville). Fig. 2. *Cellana tramoserica* (Holten). Fig. 3. *Cellana constricta* Iredale. Fig. 4. *Cellana turbator* Iredale. All from Macpherson, 1955, Proc. Roy. Soc. Victoria, vol. 67, pp. 236, 238, 239 and 240.

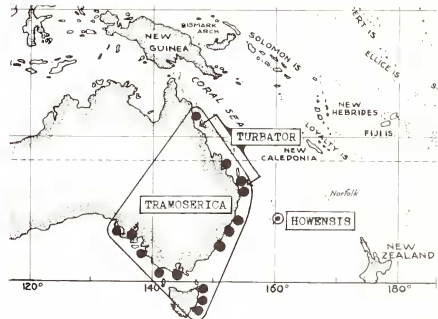


Plate 149. Geographical distribution of *Cellana tramoserica* (Holten), *Cellana turbator* Iredale and *Cellana howensis* Iredale.

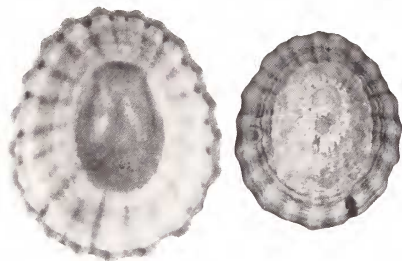


Plate 150. *Cellana solida* (Blainville, 1825). Corny Point, South Australia, 51 and 42 mm., AWBP coll. 187.

Synonymy—

- 1825 *Patella solida* Blainville, *Diect. Sci. Nat.*, vol. 38, p. 110.
 1825 *Patella rubraurantiaca* Blainville, *Diect. Sci. Nat.*, vol. 38, p. 111.
 1849 *Patella limbata* Philippi (non Röding, 1798), *Abbild. und Beschri. Conch.*, vol. 3 (6), p. 71.
 1854 *Patella limbata* Philippi, *Reeve, Conch. Iconica*, pl. 13, figs. 29 a, b.
 1891 *Helcioniscus limbata* Philippi, *Pilsbry, Man. Conch.*, vol. 13, p. 143, pl. 71, figs. 53-56; pl. 17, figs. 28, 29.
 1955 *Cellana solida* Blainville, *Macpherson, Proc. Roy. Soc. Victoria*, vol. 67 (2), p. 236.
 1962 *Cellana solida* Blainville, *Macpherson and Gabriel, Mar. Moll. Victoria*, p. 45.

Records—TASMANIA: Port Arthur (AWBP coll.); Circular Head (AWBP coll.); Penguin (A. F. B. Hull; AWBP coll.); William's Island, Bass Strait. VICTORIA: Cape Otway; Wilson's Promontory (Macpherson, 1962, p. 47). SOUTH AUSTRALIA: Point Sinclair (AWBP coll.); St. Francis Island (AWBP coll.); Corny Point (AWBP coll.).

?*Cellana carpentariana* Skwarko, 1966

(Pl. 152, fig. 1)

Range—Australia, Mount Young, Northern Territory, late Neocomian, lower Cretaceous.

Remarks—This species bears some resemblance to the Recent *enneagona* Reeve, 1854 and the Australian lower Miocene *cudmorei* Chapman and Gabriel, 1923. If *carpentariana* is really a *Cellana* then it is the earliest known member of the genus.

Description—(original) "The shell is moderately large and inflated. Its apex is obtusely pointed, situated anteriorly, and not incurved. The slopes are straight in the front and on the sides of the shell but convex on the posterior wall, with a wavy posterior margin. The posterior slope is ornamented with four primary, three secondary, and six tertiary straight radial ribs which gradually increase in breadth away from the umbo. The primary ribs are straight, sharp-crested, and prominent. Radial ribbing is also

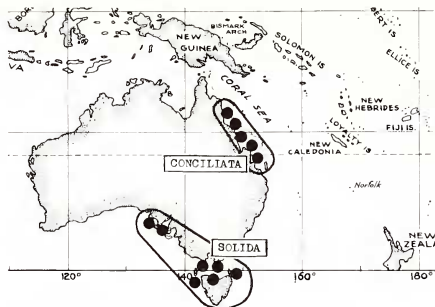


Plate 151. Geographical distribution of *Cellana conciliata* Iredale and *Cellana solida* (Blainville).

present on the sides, and on the anterior end of the shell, but is not distinct and the costae there seem to belong to one order only. Ribs are crossed by irregular growth-rugae and somewhat more irregular growth-striae".

Measurements—No size indicated other than "moderately large."

Synonymy—

- 1966 *Cellana* (?) *carpentariana* Skwarko, *Comm. Aust. Dept. Nat. Dev. Bur. Min. Res. Geol. and Geophys. Bull.* 73, p. 120, pl. 14, fig. 11.

Cellana cudmorei Chapman and Gabriel, 1923

(Pl. 152, fig. 2)

Range—Australia, polyzoal rock of Batesford, near Geelong, Victoria, Batesfordian Stage, lower Miocene.



Plate 152. Fig. 1. ?*Cellana carpentariana* Skwarko, 1966, late Neocomian, lower Cretaceous, Mt. Young, Northern Territory, Australia. Holotype, from Skwarko, 1966, pl. 14, fig. 11. Fig. 2. *Cellana cudmorei* Chapman & Gabriel, 1923, Batesford, Victoria, Australia, lower Miocene; 40 mm. Holotype, from Chapman & Gabriel, 1923, pl. 1, fig. 1.

Remarks—Chapman and Gabriel considered this species to be ancestral to *tramoserica*, but it is not related to that species, being in fact a member of the *radiata* series, as shown by the nine broad primary rays, a very similar Recent shell being *radiata* subspecies *enneagona* Reeve, 1854, with its synonym *articulata* Reeve, 1855, the latter from the Philippines. Similar shells range northward to the Bonin Islands, Japan. This tendency to develop nine primary rays occurs sporadically throughout the *radiata* series.

Description—(original) "Shell large, elevated, oval, rather strongly built; apex situated about one-third from the anterior margin. Sculpture consisting of numerous strong riblets, with two or three smaller one occupying the interspaces. Growth-lines undulate, fine, not well developed."

Measurements (mm.)—

length	width	height	
40.0	30.0	10.0	holotype

Synonymy—

1923 *Cellana cudmorci* Chapman and Gabriel, Proc. Roy. Soc. Vict., new ser., vol. 36, p. 23, pl. 1, fig. 1.

Types—The holotype is in the National Museum of Victoria.

Cellana hentyi Chapman and Gabriel, 1923

Range—Australia, shell bed at Forsyth's, Grange Burn, near Hamilton, Victoria, Kalinman Stage, lower Pliocene.

Remarks—Chapman and Gabriel compared their species firstly with *Patella peronii* (as *squamifera*) and then as an alternative with *Cellana tramoserica* (as *variegata*). However the latter interpretation is the more likely one, the sculpture being similar to that in the Recent *tramoserica*, except that the concentric lines produce knotted nodes where they cross the radials. The original illustration is too indistinct to copy.

Description—(original) "Shell of medium size, elevated, narrowly oval, apex a little in front of centre. In the present state of fossilisation the apex is denuded of ornament. Surface ornament consisting of moderately strong radiating ribs, with several intermediate, less pronounced riblets; these are crossed by growthlines which are strongly undulate and which are produced at the intersections into nodulose growths. Shell still retaining its natural colour, from olive green to black".

Measurements (mm.)—

length	width	height	
20.0	14.5	10.5	holotype

Synonymy—

1923 *Cellana hentyi* Chapman and Gabriel, Proc. Roy. Soc. Vict., new ser., vol. 36, p. 23, pl. 1, fig. 2.

Types—The holotype is in the National Museum of Victoria.

Cellana analogia Iredale, 1940

(Pl. 153, figs. 4-6)

Range—Lord Howe Island, Roach Islands

Remarks—This species is distinguished from *howensis*, another Lord Howe Island species, mainly in the form of the sculpture, the differences being especially marked when young shells of each are compared. The sculpture in *analogia* consists of coarse sharply carinated radials that are rendered scabrous to nodulose by dense concentric growth ridges, but in *howensis* the radials are flattened, have linear interspaces, and weaker concentric sculpture renders the radials only slightly granulose over the earlier growth stages, the ribbing becoming smooth towards the margin in the adult.

Description—Shell of moderate size, up to 41 mm. (1½ inches) in length, solid, broadly ovate, only moderately elevated, the apex varying from subcentral to the anterior third; margin strongly

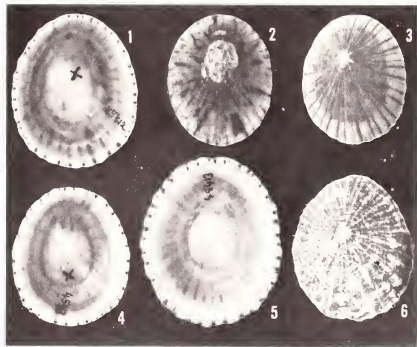


Plate 153, Figs. 1-3. *Cellana howensis* Iredale, 1940, Lord Howe Island, 30-32 mm., AWBP coll. 45412 (one marked X compared with holotype). Figs. 4-6. *Cellana analogia* Iredale, 1940, Lord Howe Island, 32-39 mm., AWBP coll. 45413 (one marked X compared with holotype).

crenulated. Sculpture strong and coarse, consisting of numerous carinated radials; primaries more or less alternating with secondaries; linear interspaces deep, and the whole surface rendered strongly scabrous to nodulose by dense concentric growth ridges. Young examples are very depressed and have 9 of the primary radials somewhat stronger than the rest. Colour of exterior dull-white; interior greyish white, the spatula yellowish to fawn, but mostly completely covered by white callus; margin white-callused, with short dark-brown lines corresponding to the external rib interstices; in some examples these radial colour lines extend intermittently, within the shell substance, almost to the spatula.

Measurements (mm.)—

<i>length</i>	<i>width</i>	<i>height</i>	
41.0	36.7	20.0	Lord Howe Id.
39.0	33.0	13.0	Lord Howe Id.
37.0	31.0	17.0	holotype
33.5	28.5	10.0	Lord Howe Id.

Synonymy—

1940 *Cellana analogia* Iredale, Aust. Zool., vol. 9 (4), p. 432, pl. 32, figs. 2, 14; pl. 33, figs. 7-9.

Types—The holotype and paratypes are in the Australian Museum, Sydney, and there is a series of topotypes in the Powell collection, Auckland.

ribbing towards the margin. Colour of exterior greenish grey to greyish buff, the narrow interspaces lined in dark-brown, and some have radial streaks of the same colour; interior yellowish to orange-brown, with the spatula dark reddish brown, usually more or less completely cloudded with greyish-white callus; the external pattern shows through strongly except in fully adult examples, which have a rounded callused margin, and in these the external radial lines form short radial dashes corresponding to the external linear interspaces.

Measurements (mm.)—

<i>length</i>	<i>width</i>	<i>height</i>	
34.0	28.0	13.25	Lord Howe Id.
31.5	26.5	13.50	holotype
31.0	26.0	18.00	Lord Howe Id.
26.0	21.0	11.50	Lord Howe Id.

Synonymy—

1940 *Cellana howensis* Iredale, Aust. Zool., vol. 9 (4), p. 432, pl. 32, figs. 1, 13; pl. 33, figs. 4-6.

Types—The holotype and paratypes are in the Australian Museum, Sydney, and there is a series of topotypes in the Powell collection, Auckland.

***Cellana craticulata* (Suter, 1905)**

(Pl. 154, 155; Pl. 156, fig. 2)

Range—Kermadec Islands.

Remarks—This is a difficult species to describe in general terms, since it is excessively variable, assuming different shapes, sizes, sculptural developments and colour patterns, presumably in relation to degrees of exposure, and vertical distribution within the tidal belt. This complex was divided by Oliver (1915, pp. 511-514) into 4 species and 2 subspecies, but his interpretation breaks down in practice, as evidenced by Oliver's own qualifying remarks (l.c. p. 511):—"examination of ample material leads one to the conclusion that in the Kermadec group there exist about four species of *Cellana* in the process of being formed out of a single species, and the young of all are frequently so much alike that a satisfactory disposition is scarcely possible."

Another significant point is that although three of the named forms have their respective type localities elsewhere in the group than Raoul Island, all six are recorded from that island. Lives on rocks from low to high water.

Description—Shell of small to moderately large size, from 21.5 to 50.6 mm. (¾-2 inches) in length,

***Cellana howensis* Iredale, 1940**

(Pl. 153, figs. 1-3)

Range—Lord Howe Island, Ned's Beach.

Remarks—This species is distinguished from the other Lord Howe Island limpet, *C. analogia*, in the form of the ribbing which consists of broad low radials that are separated by linear interspaces. There is also, a radial pattern of dark-brown lines in the rib interstices, as well as varying radial streaks of the same colour. The nearest related species seems to be the Australian *tramoserica*.

Description—Shell of moderate size, up to 34 mm. (1¾ inches) in length, rather solid, ovate, elevated, the apex at the anterior fourth; margin finely crenulated. Sculpture consisting of numerous, flattened, radial ribs of varying width, some rather broad, and all with linear interspaces; these radials are further subdivided by one or two shallower radial grooves, and the whole surface is densely and delicately concentrically crossed by growth lines that render the radials weakly granulose over the early part of the shell; there being a general smoothness of the

narrowly to broadly ovate, depressed to elevated, with weakly crenulated to strongly corrugated margins, and excessively variable sculpture and colour pattern. The typical form is elongate oval, depressed, and strongly sculptured, the radials basically in the form of distant, broadly rounded corrugations, these and the interspaces, densely overridden by narrow radial cords, which are rendered weakly nodulose by dense concentric growth lines. Coloration; externally, olive with most of the radial folds broadly radially streaked in dark-brown to black; internally, silvery with the radiate external pattern showing through,

strongest at the margin; spatula long and narrow, dark-sepia, clouded with white callus. The form *hedleyi* has the radial folds well developed but the outline is more broadly ovate; *corrugata* is similar but has maximum development of the radial folds; *vulcanica* is high-conic and coarsely ribbed but without radial folds; *scopulina* is rounded and high-conic also, but the radial sculpture is not prominent, only occasional young examples have the radial folds, and the general coloration is yellowish to pinkish orange, often with radiate streaks and interstitial dark-brown lines.

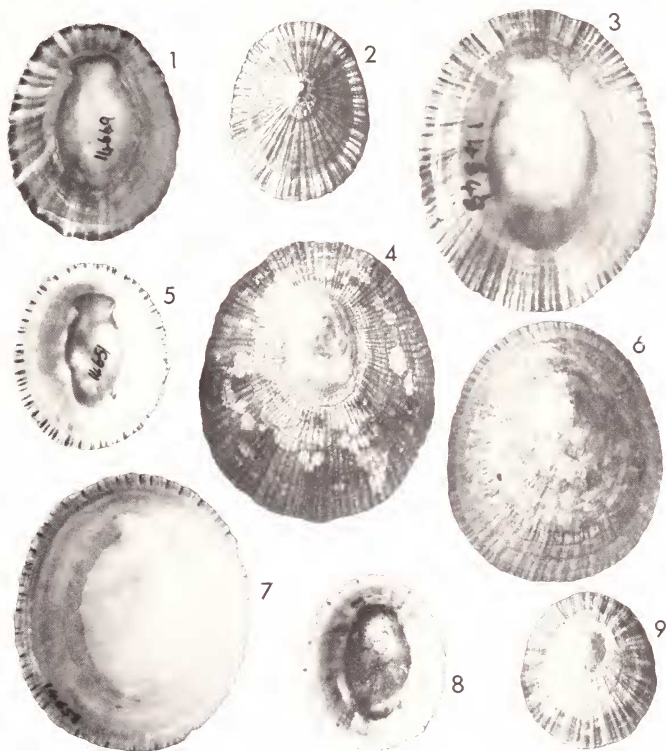


Plate 154. Figs. 1-9 *Cellana craticulata* (Suter, 1905), Kermadec Islands. Figs. 1, 2 Raoul Island (typical form), 26-30 mm., MF14649. Figs. 3, 4. Raoul Island (*prolisa* form), 35 mm., MF14648. Fig. 5. Denham Bay, Raoul Island (*prolisa* form), 29 mm., MF14651. Figs. 6, 7. French Rock (*scopulina*

form), 50 mm., MF14658. Figs. 8, 9. Raoul Island, (*scopulina* form), 21-22 mm., AWBP coll. (The MF numbers of this and the following plate refer to Dominion Museum, Wellington specimens in the W. R. B. Oliver collection; Oliver's determinations in brackets).

Measurements (mm.)—

length	width	height	
50.0	42.0	20.8	<i>scopulina</i> form, Oliver, 1915
45.8	37.5	14.2	<i>hedleyi</i> form, Oliver, 1915
42.8	37.0	11.3	<i>corrugata</i> form, Oliver, 1915
39.0	30.5	9.5	<i>hedleyi</i> form, Raoul Id.
32.2	28.0	16.3	<i>vulcanica</i> form, Oliver, 1915
31.4	26.4	7.4	<i>prolixa</i> form, Oliver, 1915
26.5	23.0	7.5	<i>scopulina</i> form, Raoul Id.
25.0	20.0	7.0	holotype of <i>craticulata</i>

Synonymy—

1905 *Helcioniscus craticulatus* Suter, Proc. Malac. Soc., Lond., vol. 6, p. 352, text figs.

- 1910 *Helcioniscus dirus* Reeve, (non Reeve, 1855) Iredale, Proc. Malac. Soc., Lond., vol. 9, p. 71.
 1910 *Helcioniscus craticulatus* Suter, Iredale, Proc. Malac. Soc., Lond., vol. 9, p. 72.
 1913 *Helcioniscus antipodium* Smith, (non E. A. Smith, 1874) Suter, Man. N. Z. Moll., p. 79 (in part).
 1915 *Cellana craticulatus* Suter, Oliver, Trans. N. Z. Inst., vol. 47, p. 511.
 1915 *Cellana craticulatus prolixa* Oliver, Trans. N. Z. Inst., vol. 47, p. 512, pl. 9, figs. 1, 1a.
 1915 *Cellana hedleyi* Oliver, Trans. N. Z. Inst., vol. 47, p. 512, pl. 9, figs. 2, 2a.
 1915 *Cellana hedleyi corrugata* Oliver, Trans. N. Z. Inst., vol. 47, p. 513, pl. 9, figs. 3, 3a.
 1915 *Cellana vulcanicus* Oliver, Trans. N. Z. Inst., vol. 47, p. 513, pl. 9, figs. 4, 4a.
 1915 *Cellana scopulibus* Oliver, Trans. N. Z. Inst., vol. 47, p. 514, pl. 9, figs. 5, 5a.

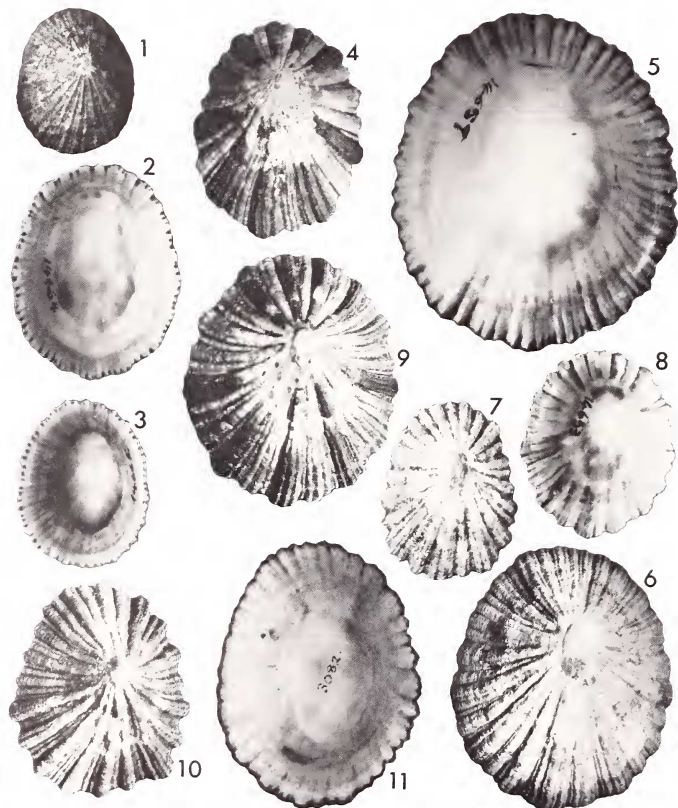


Plate 155. Figs. 1-11. *Cellana craticulata* (Suter, 1905), Kermadec Islands (continued). Figs. 1-3. Meyer Island (*vulcanica* form), 25-35 mm. (Fig. 3, compared with holotype), MF14664 & MF14665. Figs. 4-6 Raoul Island (*hedleyi* form),

32-46 mm., MF14659. Figs. 7, 8. Coral Bay, Raoul Island (*hedleyi corrugata* form), 35 mm., MF14653. Figs. 9-11. Macaulay Island (*hedleyi corrugata* form), 38-44 mm., MF3082.



Plate 156. Fig. 1. *Cellana radians* (Gmelin), New Zealand, Ti Point, Hauraki Gulf, Radula. Fig. 2. *Cellana craticulata* (Suter), Macaulay Island, Kermadecs, Radula.

Types—The holotype of *craticulata* is in the Suter collection, New Zealand Geological Survey, Wellington, and the Oliver collection is in the Dominion Museum, Wellington.

Records—KERMADEC ISLANDS. Raoul or Sunday Island (holotype); (Auck. Mus.; AWBP coll.); Meyer Islet (AWBP coll.); Macaulay Island (Oliver, 1915); French Rock (Oliver, 1915; AWBP coll.).

Cellana denticulata (Martyn, 1784)¹

(Pl. 70, figs. 7, 8; Pl. 157, figs. 5, 6; Pl. 163, fig. 2)

Range—New Zealand. Three Kings Islands, North Island, and northern part of South Island.

Remarks—This shell is readily distinguished by its prominent brown scaly ribs, netted with brown in the interstices, and by its internal coloration, the spatula being cream to orange-brown, and the rest of the interior rayed and netted in dark-brown upon a bluish grey ground.

This is the dominant limpet of the Cook Strait area, and from there it extends southward to at least Kaikoura. In its northern range, up the North Island east coast, it reaches the Three Kings Islands, but is not generally distributed in the north. These northern isolated small colonies are situated on certain jutting points and off shore islands, which evidently are catchments for larvae transported by coastwise currents.

Description—Shell of moderate to large size, up to 74 mm. (almost 3 inches) in length, solid, elevated, regularly, closely and strongly radially

ribbed, the whole surface crossed by numerous lamellose concentric ridges that thicken into granular scales on the radials. Colour of exterior greyish, with the radials and a netted interstitial pattern in dark brown; interior brownish with the external pattern showing through strongly in brown or purplish brown. The well defined spatula varies from cream to orange-brown, and there is sometimes a bluish white area between there and the brown blotched margin.

Measurements (mm.)—

length	width	height	
74.0	63.0	37.0	Karewa Island
73.0	61.0	44.0	Karewa Island
71.5	60.0	29.0	Mt Maungani
52.0	43.0	19.0	Island Bay
43.5	35.0	15.0	Island Bay

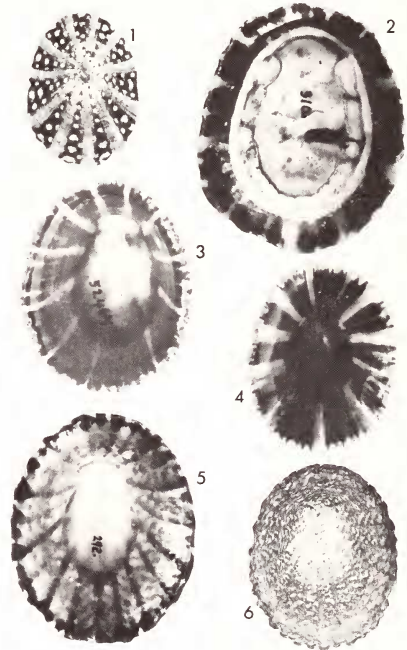


Plate 157. Figs. 1-4. *Cellana ornata* (Dillwyn, 1817), New Zealand. Fig. 1. Moutitara, West Coast, Auckland, 21 mm., AWBP coll. Fig. 2. Charleston, West Coast, South Island (surf-beaten form), 42 mm., AWBP coll. 310. Fig. 3. Bluff, Southland, 42 mm., AWBP coll. 52467. Fig. 4. Campbell's Bay, Auckland, 34 mm., AWBP coll. 26270. Figs. 5, 6. *Cellana denticulata* (Martyn, 1784), New Zealand, Island Bay, Wellington, 45-48 mm., AWBP coll. 292.

¹This name and others of Martyn, 1784, relevant to the New Zealand fauna, were validated by the International Commission of Zoological Nomenclature, in Opinion 479 (1957).

Radula—Formula (3) + 1 + (1+0+1) + 1 + (3). *Radula* very similar to that of *radians*, with both the pair of functional centrals and the pair of laterals with long lanceolate cusps set ventrally to the shank, and the lower cutting edge of the lateral is indented in two places. The non-functional fused marginal plates have three short parallel ridges at the base as in *radians* and *flava*.

Synonymy—

- 1784 *Patella denticulata* Martyn, Univ. Conch., vol. 2, fig. 65. Name validated by I. C. Z. N., opinion 479 (1957).
 1855 *Patella imbricata* Reeve, Conch. Iconica, pl. 32, figs. 93 a, b.
 1880 *Patella reevei* Hutton, Man. N. Z. Moll., p. 108, nom. nov. pro *P. imbricata* Reeve, 1855, non Turton, 1802.
 1891 *Helcioniscus denticulatus*: Pilsbry, Man. Conch., vol. 13, p. 138, pl. 68, figs. 23, 24, pl. 21, figs. 49, 50.
 1913 *Helcioniscus denticulatus*: Suter, Man. N. Z. Moll., p. 80, pl. 7, fig. 10.
 1957 *Patella denticulata* Martyn: validation of name, I. C. Z. M. opinion 479, p. 369.

Records—NEW ZEALAND: Three Kings Islands, Great Island (AWBP); North Island; Cape Maria van Diemen (AWBP); Karewa Island, Bay of Plenty (Auck. Mus.); Mt. Maungani (AWBP coll.); Island Bay, Wellington (AWBP coll.); South Island; Goose Bay, Kaikoura (AWBP coll.).

Cellana flava (Hutton, 1873)

(Pl. 70, figs. 5, 6; Pls. 158, 159)

Range—New Zealand, east coast of both North and South Islands, from East Cape to Motanau Island, north Canterbury.

Remarks—This bright yellowish to orange limpet, long considered to be only a subspecies of *radians*, merits specific separation from that species, not only on account of its distinctive

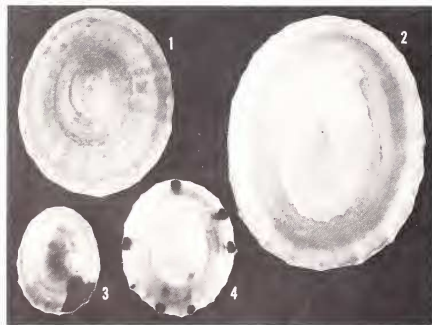


Plate 158. *Cellana flava* (Hutton, 1873), New Zealand. Fig. 1, East Cape; North Island, 41 mm., AWBP coll. 52732. Figs. 2-4, Limestone Point, Marlborough, South Island, 18-51 mm. (Note the dark rays found occasionally in some young examples; AWBP coll. 6872; Figs. 3, 4).

coloration but also, by virtue of its simple yet relatively constant form of sculpture, short stubby cephalic tentacles, and peculiar vestigial central radular plate.

The species has its centre of distribution along the Kaikoura-Amuri Bluff coast of Marlborough where it occurs in great numbers on white limestone in the mid- to low-tidal zone. Like *denticulata*, its extra-limital occurrences are sporadic, and almost always on prominences of the coastline. The pale coloration possibly resulted from long association with a white limestone substratum, but if so, it cannot be a direct response, for bright-orange examples are just as likely to be found living on dark rock, notably at Whakatake, near Castle Point, in the North Island.

Description—Shell of moderate size to rather large, up to 66 mm. (over 2½ inches) in length, solid, elevated, with the apex varying from sub-central to about the anterior third. Sculpture simple and rather constant, consisting of from 19 to 25 strong, rounded, primary radials, with an occasional much weaker intermediate that develops only towards the margin. Colour, both externally and internally, pale-yellow to bright-orange. In senile examples the exterior is usually eroded to dull grey or whitish, and the interior is whitish also, except for the large spatula, which is invariably yellowish to orange. Occasional

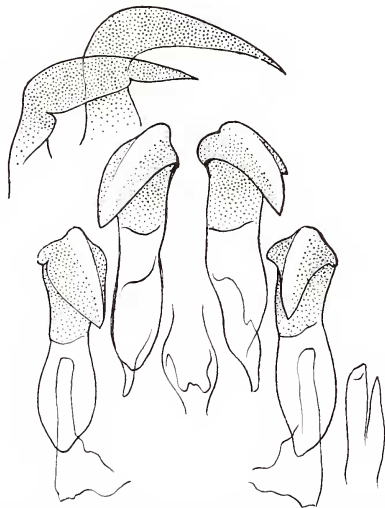


Plate 159. *Cellana flava* (Hutton), New Zealand, East Cape. *Radula*.

young shells have several irregularly disposed brown radial stripes developed only towards the margin.

Radula—Formula 3 + 1 + (1+(1)+) + 1 + 3; very similar to the radula of *radians*, even to the appearance of a vertical alternation of long and short marginals, but the vestigial central plate is different, being foliated, open above, and with the front edge scalloped into five cusp-like lobes (East Cape example).

Measurements (mm.)—

length	width	height	
66.0	55.0	27.0	Karaka Point
58.0	48.5	28.0	Limestone Point
47.5	37.5	19.5	Limestone Point
35.5	29.5	14.5	Limestone Point

Synonymy—

- 1873 *Patella flava* Hutton, Cat. N. Z. Moll., p. 44.
 1891 *Helcioniscus flavus*: Pilsbry, Man. Conch., vol. 13, p. 142.
 1913 *Helcioniscus radians flavus*: Suter, Man. N. Z. Moll., p. 84; Atlas (1915), pl. 7, fig. 18.

Types—The type is in the Dominion Museum, Wellington.

Records—NEW ZEALAND: North Island; Horoera, East Cape; Gisborne; Tolaga Bay; Whakatake; Castlepoint, East Wairarapa. South Island: Karaka Bay, Queen Charlotte Sound; Limestone Point, S. of Clarence River, Marlborough (all AWBP coll.); Kaikoura, Amuri Bluff and Motanau Island (Suter, 1913).

Cellana ornata (Dillwyn, 1817)

(Pl. 70, figs. 12, 13; Pls. 157, 163)

Range—New Zealand: North, South and Stewart Islands.

Remarks—In its young non-eroded state this species has a most attractive colour pattern, the primary ribs being lilac-grey, and the intermediate areas purplish brown to black, with the nodes picked out in white. In large-sized examples the exterior is almost invariably eroded and little of the basic colour pattern remains. Also, in coastal areas subject to rigorous wave action, the profile is low, and the shape varies from elongate-ovate to broadly-ovate. This species is common on rock faces in the upper tidal zone.

Description—Shell small to moderate sized, up to 48 mm. (almost 2 inches) in length, but usually between 24 and 28 mm., solid, normally high-conical, with the apex at about the anterior third. Sculpture consisting of eleven strong, primary, radial ribs, each interspace with a central nodulose secondary radial, flanked on each side by a pair of much weaker radials; the whole crossed by dense concentric threads, that thicken like knots, wherever they surmount the primary and secondary radials. Colour of exterior: the primary ribs pale lilac-grey, the interspaces dark purplish brown to almost black,

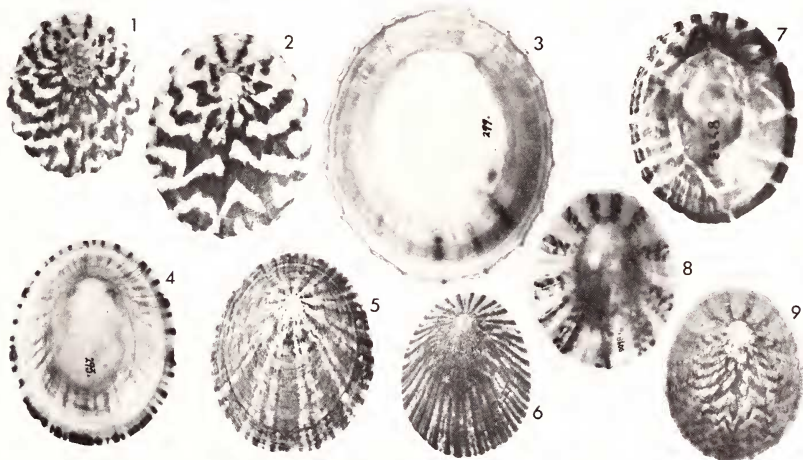


Plate 160. Figs. 1-9. *Cellana radians* (Gmelin, 1791), New Zealand, 23-65 mm. Fig. 1. *cahillii* pattern, Motutara, West Coast, Auckland, AWBP coll. 252. Figs. 2-5. Mount Maungamui, Bay of Plenty, AWBP coll. 52469, 293 & 299. Figs.

6, 7. Four miles south of Clarence River, Marlborough, AWBP coll. 3783. Figs. 8, 9. Motuhia Island, Hauraki Gulf, Auckland, AWBP coll. 18600.

with the nodes on the secondary radials picked out in white. Color of interior: with broad, dark purplish brown rays and silvery intermediate narrow rays; spatula dark chestnut-brown to almost black, often partly clouded with greyish callus.

Radula—Formula (3) + 1 + (1+0+1) + 1 + (3); similar to the radula of *radians*, the paired centrals each with a long lanceolate cusp, set tangentially to the shank, and the laterals similar but heavier, with the lower edge indented to form two denticles; the three marginals are fused into a small irregularly-shaped, semitransparent plate, without cusps.

Measurements (mm.)—(all A.W.B. Powell collection).

length	width	height	
48.0	44.5	21.0	Motutara
44.0	34.0	11.0	Charleston
42.5	35.0	21.0	Bluff
42.0	35.0	19.0	Mt. Maunganui
28.0	22.0	13.0	Motutara
22.5	18.5	7.0	Motutara

Synonymy—

- 1817 *Patella ornata* Dillwyn, Cat. Rec. Shells, vol. 2, p. 1029; based upon Martini-Chemnitz, Conch. Cab., vol. 11, p. 180, pl. 197, figs. 1914, 1915.
 1841 *Patella nodosa* Hombrom & Jacquinet, Ann. Sci. Nat., vol. 2 (16), p. 191.
 1846 *Patella lactuosa* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 150.
 1855 *Patella margaritaria* Reeve, Conch. Iconica, pl. 28, figs. 74 a, b.
 1883 *Patella 'denticulata'* (error for *ornata*); Hutton, Trans. N. Z. Inst., vol. 15, p. 128, pl. 16, fig. B (radula).
 1891 *Helcioniscus ornatus*: Pilsbry, Man. Conch., vol. 13, p. 137, pl. 68, figs. 14-19; pl. 19, figs. 39, 40.
 1913 *Helcioniscus ornatus*: Suter, Man. N. Z. Moll., p. 50; Atlas (1915), pl. 7, fig. 11.
 1913 *Helcioniscus ornatus inconspicuus*: (non Gray, 1843), Suter, Man. N. Z. Moll., p. 51; Atlas (1915), pl. 7, fig. 12.

Records—NEW ZEALAND: North Island; Cape Maria van Diemen (Auck. Mus.); Reotahi, Whangarei Heads; Motuhii Island, Auckland; Campbell's Bay, Auckland; Motutara, West Coast, Auckland; Mt. Maunganui, Bay of Plenty; Napier, South Island; 4 mi. S. of Clarence River, Marlborough; Lyttelton; Cape Foulwind; Charleston; Oamaru; Kartigi Beach, north Otago (all AWBP coll.); Taieri Beach, Otago (Auck. Mus.); Solander Island, Foveaux Strait (Auck. Mus.); Stewart Island; Herekopare Island (both AWBP coll.).

Cellana radians (Gmelin, 1791)

(Pl. 70, figs. 1-4; Pls. 156, 160, 161)

Range—New Zealand: North, South and Stewart Islands.

Remarks—This is the most common of the New Zealand limpets and the most variable, not only in shape and sculpture, but also in colour pattern.

The many forms of the species are outlined in the following formal description. In general, northern shells, which are the typical form, have the primary ribs coloured brown, and there is often a connecting pattern of transverse streaks (the *earlii* pattern). Most southern shells, on the other hand, have the sculpture finer, more even, the external markings indistinct, and internally there is a greenish silvery to golden lustre. This, the *perana* form, is the dominant one at Stewart Island and the southern part of the South Island, but it is known to occur also on the west coast of the North Island at Whitecliffs, north Taranaki, and also at the Three Kings Islands. On the other hand, at Cape Foulwind on west coast of the South Island both the *perana* and *earlii* forms occur together. The *earlii* pattern, which is more common in northern shells, is essentially a juvenile one, and seldom persists into the fully adult, without resolving into radial streaks, more or less confined to the primary radials.

Thomson (1919), in his paper on polymorphism in *Cellana radians* was of the opinion that colour pattern changes in the fully adult of this species were due to external erosion, accompanied by a compensating internal build-up of callus. In such senile examples only deep-seated colour, associated with the primary radials still persists.

Helcioniscus radians mestayerae Suter, 1906, is not a New Zealand shell, despite the cited locality, Stewart Island, but is based upon a wrongly labelled specimen of the Indo-Pacific *Cellana testudinaria* Linnaeus, 1758.

Description—Shell of medium to moderately large size, up to 65.5 mm. (2½ inches) in length, polymorphic, extremely variable in shape, altitude and colour pattern. Typical form ovate, depressed, with the apex at about the anterior fourth; sculptured with 20 to 25 narrow, slightly raised primary radials, and a varying number of very weak radial threads in the interspaces, but often, the latter are subobsolete; the whole surface crossed by weak, but exceedingly dense, concentric lirations. Colour of exterior greyish buff, with a reddish brown pattern of interrupted radial lines and transverse streaks; interior yellowish, with the external brown markings showing through strongly; spatula ill-defined, fawn to chestnut-brown. In the *earlii* form the transverse streaks are dominant, and join up in a concentric anastomosing pattern. In the *decora* form the pattern is restricted to radial lines; and in the *perana* form the sculpture is fine and more regular, the external coloration of dark, continuous

or intermittent, radial lines, and internally it is greenish silvery to golden, sometimes partly clouded to fully obscured by a white callus.

Radula—Formula $3 + 1 + (1+0+1) + 1 + 3$. There is a pair of strong centrals, each with a long lanceolate cusp, set tangentially to the shank, and in between these two teeth is a small, narrow, vestigial median plate; the pair of laterals are similar but have a broadly triangular base, and the lower cutting edge of the cusp is indented to form two denticles; all three marginals are present but they are very thin and semitransparent; only the inner one bears a slight cusp, and below these, joined by a thin membrane are three shorter

narrow plates, the effect being of long and short marginals in a vertical alternation.

Measurements (mm.)—(A=typical form; B=*earlii* form; C=*perana* form. All from the A. W. B. Powell coll'n.

length	width	height	
65.5	55.0	24.0	(A) Mt Maungani
64.5	54.5	26.0	(C) Herekopare Island
62.0	50.0	30.0	(C) Herekopare Island
59.0	50.5	16.0	(A) Mt Maungani
57.0	48.0	20.0	(C) Herekopare Island
46.0	37.5	12.0	(A) Motuhi Island
43.5	35.5	17.0	(C) Herekopare Island
41.5	34.0	20.5	(C) Cape Foulwind
35.5	28.0	7.75	(B) Cape Foulwind
28.0	22.5	6.0	(A) Little Barrier Id.
18.5	15.0	3.0	(B) Little Barrier Id.

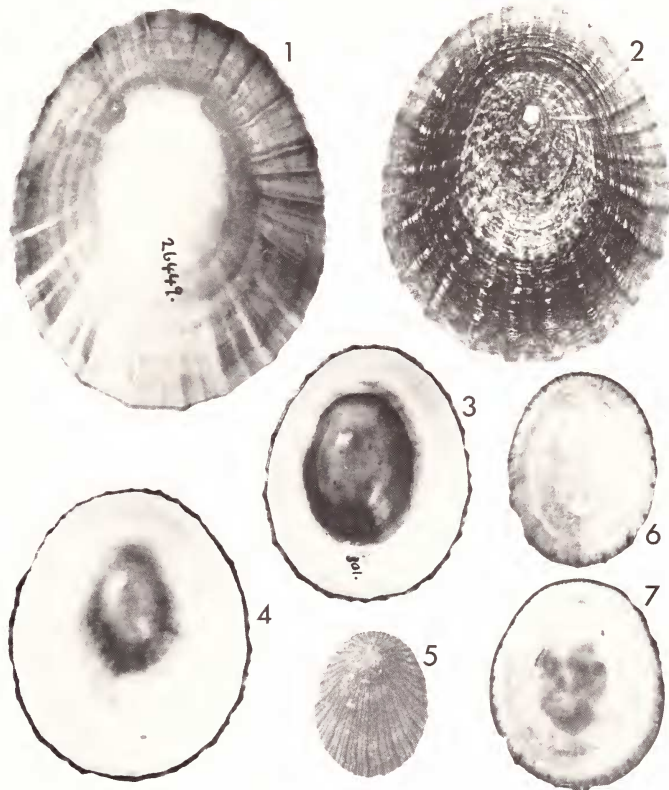


Plate 161. Figs. 1-7. *Cellana radians* (Gmelin, 1791) (*perana* form). Figs. 1, 2. Herekopare Island, Stewart Island, 57 mm., AWBP coll. 26449. Figs. 3, 4. Lyttelton, South Island, 41-44

mm., AWBP coll. 301. Figs. 5-7. North West Landing, Great Island, Three Kings Islands, New Zealand, 25-35 mm., AWBP coll. 52687.

Synonymy—

- 1791 *Patella radians* Gmelin, Syst. Nat., ed. 13, p. 3720; based upon Martini-Chemnitz, Conch. Cab., vol. 10, pl. 168, fig. 1618.
- 1830 *Patella argyropsis* Lesson, Voy. Coquille, Zool., vol. 2, p. 419.
- 1830 *Patella pholidota* Lesson, Voy. Coquille, Zool., vol. 2, p. 420.
- 1834 *Patella argentea* Quoy and Gaimard, Voy. Astrolabe, Zool., vol. 3, p. 345, pl. 70, figs. 16, 17.
- 1841 *Patella radiatilis* Hombrom and Jacquinet, Ann. des Sci. Nat., vol. 16, p. 191.
- 1848 *Patella orichalcea* Philippi, Zeitschr. f. Malak., p. 163.
- 1849 *Patella decora* Philippi, Zeitschr. f. Malak., p. 162.
- 1854 *Patella decora* Philippi, Reeve, Conch. Iconica, pl. 15, figs. 33 a-c.
- 1855 *Patella earlii* Reeve, Conch. Iconica, pl. 27, figs. 71 a, b.
- 1873 *Patella flexuosa* (non Quoy and Gaimard, 1834), Hutton, Cat. Mar. Moll. N. Z., p. 45.
- 1874 *Patella antipodum* E. A. Smith, Voy. Erub. & Terr. Moll., p. 4, pl. 1, fig. 25.
- 1882 *Patella olivacea* Hutton, N. Z. Journ. Sci., vol. 1, p. 69.
- 1891 *Helcioniscus radians* Gmelin, Pilsbry, Man. Conch., vol. 13, p. 139, pl. 23, figs. 4, 6, 7, 8; pl. 69, figs. 25-31, 34-37 (non figs. 32, 33, 35 & 39).
- 1913 *Helcioniscus radians* Gmelin, Suter, Man. N. Z. Moll., p. 81, pl. 7, fig. 13.
- 1913 *Helcioniscus radians argenteus* Q. and G., Suter, Man. N. Z. Moll., p. 82.
- 1913 *Helcioniscus radians decorus* Philippi, Suter, Man. N. Z. Moll., p. 82.
- 1913 *Helcioniscus radians earlii* Reeve, Suter, Man. N. Z. Moll., p. 83.
- 1913 *Helcioniscus radians olivaceus* Hutton, Suter, Man. N. Z. Moll., p. 84.
- 1915 *Cellana radians perana* Iredale, Trans. N. Z. Inst., vol. 47, p. 432; nom. nov. pro *Patella olivacea* Hutton, 1882; non Anton, 1839.

- 1919 *Cellana radians* Gmelin, Thomson, N. Z. Journ. Sci. Tech., vol. 2, pp. 264-267 (polymorphism).
- 1923 *Helcioniscus radians* Gmelin, Eales, Brit. Antarct. ("Terra Nova") Exped., 1910, Moll., pt. 5, pp. 3-6, text, fig. 2 (radula).

Records—NEW ZEALAND (typical form): Three Kings Islands, Great Island (F. Climo, 1970); North Island: Cape Maria van Diemen (Auck. Mus.); Busby Head, Whangarei Heads, Little Barrier Island, Motuhi Island, Auckland; Motutara, west coast, Auckland; Mt. Maungani; Gisborne; Tolaga Bay; Island Bay, Wellington; South Island: Cape Foulwind (all AWBP coll.); Lyttelton (AM.); Dowling Bay, Dunedin (Auck. Mus.). Stewart Island: The Neck, Patterson Inlet (AWBP coll.).

(*perana* form): North Island: White Cliffs, north Taranaki. South Island: Goose Bay, Kaikoura; Cape Foulwind; Wainui, Akaroa; Lyttelton; Charleston; Purakanni, Otago; Timaru, Otago; St. Clair, Dunedin; Ocean Beach, Bluff. Stewart Island: Hekerepare Island (all AWBP coll.).

Cellana stellifera (Gmelin, 1791)

(Pl. 70, figs. 9-11; Pls. 162, 163)

Range—New Zealand; North, South and Stewart Islands.

Remarks—This species lives at and just below low tide on smooth rock faces in clean water situations but is not generally common. It is easily recognised by its reddish brown external colour, bluish silvery interior, and usual presence of an apical star in paler colour. It is more abundant in the northern part of its range.

Description—Shell of moderate size, 30 to 71 mm. (1½ to 2¾ inches) in length, broadly ovate and of low to moderate height, with the apex at about the anterior third, sculptured with numerous low rounded radial ridges, crossed by dense delicate concentric growth lamellae; margin weakly scalloped. Colour, externally dark reddish brown, mostly showing a white or pale yellowish star at the apex, this often persisting to the adult stage, and occasionally with long rays extending from the points of the star right to the margin; interior bluish or purplish grey with a silvery sheen, the star pattern usually showing through; spatula ill-defined, a chestnut smear often clouded by a whitish callus.

Measurements (mm.)—

length	width	height	
71.0	58.0	19.0	Whangarei Heads
57.5	47.5	19.0	Whangarei Heads
45.5	37.0	14.0	Whangarei Heads
33.0	26.5	10.5	Rocks Road, Nelson

Synonymy—

- 1791 *Patella stellifera* Gmelin, Syst. Nat., ed. 13, p. 3719, based upon Martini-Chemnitz, Conch. Cab., vol. 10, pl. 168, fig. 1617.

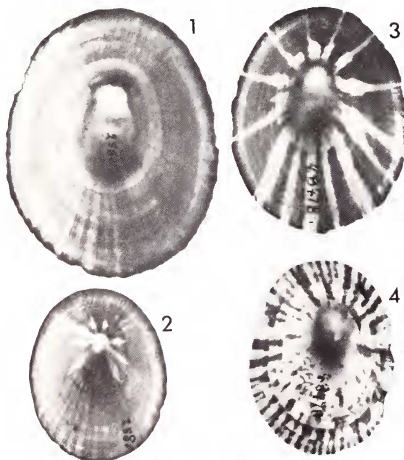


Plate 162. *Cellana stellifera* (Gmelin, 1791), New Zealand. Figs. 1, 2. Island Bay, Wellington, 33-50 mm., AWBP coll. 258. Figs. 3, 4. Rocks Road, Nelson, 29-33 mm., AWBP coll. 48178.

- 1834 *Patella stellularia* Quoy and Gaimard, Voy. Astrolabe, Zool., vol. 3, p. 347, pl. 70, figs. 18-20.
- 1855 *Patella stellularia* Q. and G. Reeve, Conch. Iconica, pl. 33, figs. 96 a, b.
- 1891 *Helcioniscus stellifera* Q. and G., Pilsbry, Man. Conch., vol. 13, p. 141, pl. 70, figs. 43-45.
- 1905 *Helcioniscus stelliferus phymatus* Suter, Proc. Malac. Soc., Lond., vol. 6, p. 350, text fig.
- 1913 *Helcioniscus stelliferus* Q. and G., Suter, Man. N. Z. Moll., p. 86; Atlas (1915), pl. 7, fig. 21.
- 1915 *Cellana stellifera*: Iredale, Trans. N. Z. Inst., vol. 47, p. 432.

Types—The Martini-Chemnitz specimens are possibly in the University Museum, Copenhagen. The cited type locality "Friendly Islands" is erroneous.

Records—NEW ZEALAND: North Island; Cape Maria van Diemen (Auck. Mus.); Busby Head, Whangarei Heads; Little Barrier Island; Kawau Island; Mt. Maungani, Island Bay, Wellington. South Island; Rocks Road, Nelson (all AWBP coll.); New Brighton (Suter, 1913). Stewart Island; Eulchre Creek (AWBP coll.). (Suter's Campbell Island record is based erroneously upon *Patinigera terroris* (Filhol, 1850)).

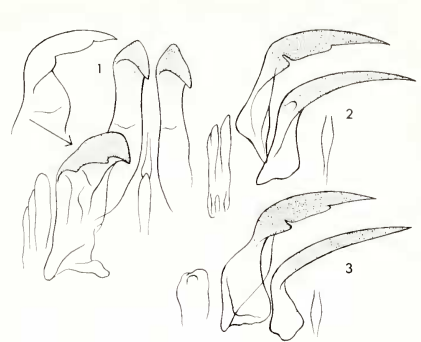


Plate 163. Radulae of New Zealand *Cellana*. Fig. 1. *Cellana stellifera* (Gmelin), Ti Point, Hauraki Gulf, Auckland. Fig. 2. *Cellana denticulata* (Martyn), Makara, Wellington. Fig. 3. *Cellana ornata* (Dillwyn), East Cape, North Island. In figs. 2 and 3 the centrals and laterals are shown in semi-profile.

Key to the subspecies of *Cellana strigilis*

- 1. Nucleus at anterior third to seventh of shell
 - A. Shell held to light showing pale spots and shapes (ocellate)
 - a. Outline broadly ovate
 - External colour bluish white, rayed and blotched with light-brown; internal pattern dark-rayed, interrupted at margin *redimiculum*
 - External colour almost completely clouded sooty-grey to dark-brown; internal pattern dark-rayed, confluent at margin *strigilis*
 - b. Outline narrowly ovate
 - External colour almost completely clouded with olive-brown; internal pattern dark-rayed, connected at margin *flemingi*
 - B. Shell held to light showing dense pattern of irregular narrow radials
 - External colour greenish grey, with dense pattern of brown radials; internal pattern dark-rayed, interrupted at margin
 - Outline narrowly ovate *bollonsi*
 - Outline broadly ovate *chathamensis*
- 2. Nucleus at anterior 10th to 27th of shell; shell held to light showing heavy radial streaks; outline narrowly ovate; external colour bluish white, rayed and heavily blotched; internal pattern dark-rayed, interrupted at margin *oliveri*

***Cellana strigilis* (Hombron and Jacquinot, 1841)**

Range—South Island, Stewart Island, Chatham Islands, and southern islands of New Zealand.

Remarks—The genus *Cellana* is typically warm-water Indo-Pacific distribution, so it is remarkable to find the genus extending to as far south as Campbell Island, 52° 30'S. These occurrences are probably relict from former warmer geologi-

cal times, for all the islands concerned stand upon the extensive submarine platform surrounding New Zealand (See Plate 99).

Subspecies have developed in isolation, and although they are all closely allied, recognisable differences are apparent in the shells from these segregated populations. A key to these subspecies follows:

Cellana strigilis subspecies
strigilis (Hombron and Jacquinot, 1841)

(Pl. 70, figs. 14, 15, Pls. 164, 168)

Range—Auckland and Campbell Islands, southern New Zealand.

Remarks—The southern islands' *strigilis* and the mainland *redimiculum* are closely allied, but always easily distinguished by the fact that the former is dark, with the interior sooty-grey, having an underlying densely mottled pattern in dark-brown, which forms an approximately continuous dark margin to the shell. On the other hand, *redimiculum* is yellowish brown, with dark

reddish brown radials that do not anastomose at the margin.

Description—Shell large, up to 80 mm. (3¼ inches) in length, solid, broadly-ovate, elevated, with the apex varying between the anterior third and sixth. Sculpture consisting of 20 to 25 strong, rounded, radial ribs, mostly with a weaker radial in each interspace; the whole surface crossed by dense, weak, concentric growth lines. Colour of exterior dark brown or greenish, to almost black, with a few spots and streaks of yellowish-white, much more prominent when the shell is held to the light; interior purplish-brown to sooty-grey, clouded and indistinctly rayed with dark brown,

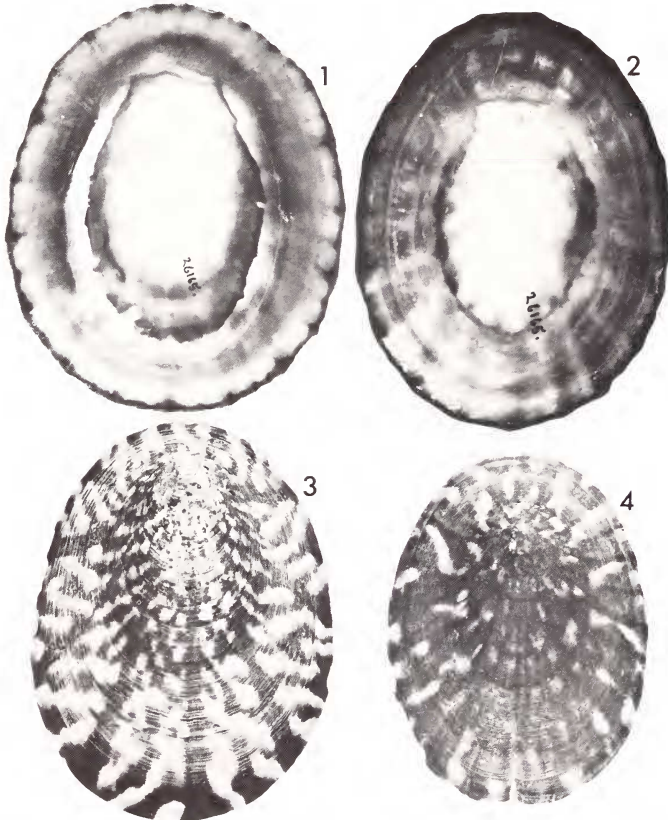


Plate 164 *Cellana strigilis* (Hombron & Jacquinot, 1841). Figs. 1, 2. Perseverance Harbour, Campbell Island, 78 mm., AWBP coll. 26165. Fig. 3. Under South Col, Campbell Is-

land, 37 mm., AWBP coll. 42168. Fig. 4. Garden Cove, Campbell Island, 46 mm., AWBP coll. 42169.

spatula light yellowish-brown, irregularly margined in dark grey. In non eroded young shells the ground colour varies from russet-brown through greenish grey to almost black, with the interstitial odd spots and splashes pale bluish.

Measurements (mm.)—

length	width	height	
80.0	68.0	39.0	Campbell Island
77.5	66.5	30.0	Campbell Island
70.0	60.0	34.0	Shoal Pt., Campbell Id.
65.0	52.0	46.0	Shoal Pt., Campbell Id.
57.0	42.5	17.0	Garden Cove, Campbell Id.
35.0	31.0	12.5	Garden Cove, Campbell Id.

Synonymy—

- 1841 *Patella strigilis* Hombron and Jacquinot, Ann. Sci. Nat., vol. 2, pt. 16, p. 190.
 1846 *Patella illuminata* Gould, Proc. Boston Soc. Nat. Hist., vol. 2, p. 149.
 1891 *Helcioniscus strigilis* H. and J., Pilsbry, Man. Conch., vol. 13, p. 137.
 1891 *Helcioniscus illuminata* Gould, Pilsbry, Man. Conch., vol. 13, p. 142, pl. 70, figs. 40-42.
 1913 *Helcioniscus strigilis* (in part): Suter, Man. N. Z. Moll., p. 87.
 1924 *Cellana radians* Gmelin, Odhner, N. Z. Moll., Pap. Mortensen Pacific Exped., p. 11 (non Gmelin, 1791).
 1927 *Nacella strigilis* H. and J. Finlay, Trans. N. Z. Inst., vol. 57, p. 387.
 1955 *Cellana strigilis strigilis* H. and J. Powell, D. S. I. R., Cape Exped. Ser., Bull. no. 15, p. 70.

Types—The type of *strigilis* is in the Muséum National d' Histoire Naturelle, Paris, and that of *illuminata* in the United States National Museum, Washington.

Records—Southern islands of New Zealand: AUCKLAND ISLANDS (type): Musgrave Peninsula; Tagna Bay, Carnley Harbour; Crozier Point; Waterfall Inlet; Rose Island, Port Ross, and Enderby Island (NZGS); Carnley Harbour; Hanfield Inlet (both AWBP coll.). CAMPBELL ISLAND: Perseverance Harbour (NZGS; AWBP coll.); Shoal Point (Auck. Mus.); Monument Harbour (Cape Exped., 1945).

Cellana strigilis subspecies *bollonsi* Powell, 1955

(Pl. 165, figs. 1,2)

Range—Antipodes Islands, southern New Zealand.

Remarks—This subspecies is easily recognised by its dense pattern of interstitial brown lines and streaks on a greenish grey ground. Occasionally the subspecies *chathamensis* has a similar pattern in juvenile shells, but it never persists into the adult stage, as it does invariably in *bollonsi*.

Description—Shell of moderate size to relatively large, up to 70.5 mm. (2¾ inches) in length, solid, narrowly ovate, depressed to moderately eleva-

ted, with the apex varying between the anterior fifth and seventh. Sculpture developing from scarcely raised radial folds in juveniles to from 20 to 24 narrowly rounded, sharply raised ribs in the adult. Colour of exterior greenish-grey, the radials marked out in light-brown to reddish-brown, plus a dense overall pattern, in these same colours, in the form of interstitial meandering radial lines and streaks; interior metallic dull blue-grey, with reddish-brown external pattern showing through; spatula buff to pale brown.

Measurements (mm.)—

length	width	height	
70.5	58.0	28.0	Antipodes Ids.
62.0	49.0	21.0	Antipodes Ids.
48.5	36.0	15.0	Antipodes Ids.
48.0	34.8	14.5	Antipodes Ids.
42.0	32.0	12.0	Antipodes Ids.

Synonymy—

- 1955 *Cellana strigilis bollonsi* Powell, Dept. Sci. and Indust. Res., Cape Exped. Ser., Bull. no. 15, p. 73, pl. 5, figs. 51-53.

Types—The holotype and paratypes are in the Dominion Museum, Wellington.

Records—ANTIPODES ISLANDS (holotype and paratypes); (AWBP coll.).

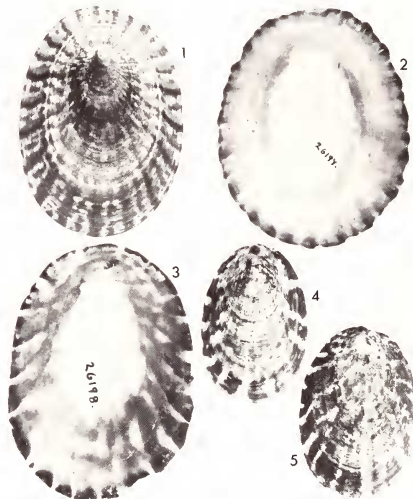


Plate 165. Figs. 1, 2. *Cellana strigilis* subspecies *bollonsi* Powell, 1955, Antipodes Islands, 48-62 mm., AWBP coll. 26197, 28420. Figs. 3-5 *Cellana strigilis* subspecies *oliveri* Powell, 1955, Bounty Islands, 35-47 mm., AWBP coll. 26198.

Cellana strigilis subspecies *chathamensis*
(Pilsbry, 1891)

(Pl. 167; Pl. 168, fig. 1)

Range—Chatham Islands, New Zealand.

Remarks—This subspecies resembles *redimiculum* in its simple radiate reddish brown radials, not coalescent at the margin, but the shape is more roundly arched, and the ocellate pattern is not in evidence. On the other hand some juveniles have a dense meandering pattern, reminiscent of the *bollosi* pattern.

Description—Shell of moderate to large size, up to 73.5 mm. (2½ inches), in length, solid, ovate, elevated, and roundly arched in profile, with the apex at about the anterior third. Sculpture consisting of from 21 to 25 moderately strong,

rounded, radial ribs, with a weaker one in most interspaces; the whole surface crowded with concentric growth lirations, weak over the early stages of the shell but stronger towards the margin, where they become slightly knotted across the radials. Colour of exterior pale yellowish-brown to greyish lilac, the radials lined in reddish brown; internally, silvery to yellowish brown, with regular reddish brown radial lines, corresponding to the external ribbing, their terminal points not coalescent at the margin; spatula large, fawn to orange-brown. Juvenile shells pale yellowish to almost black, with the pattern varying from a few radial lines to a dense coverage of meandering lines and streaks.

Measurements (mm.)—

length	width	height	
73.5	56.5	35.0	Chatham Island
70.0	55.0	31.0	Chatham Island
62.0	49.0	23.5	Chatham Island
57.5	47.5	27.0	Waitangi, Chathams
56.5	45.5	20.0	Waitangi, Chathams
39.5	30.0	11.0	Pitt Id., Chathams

Synonymy—

- 1891 *Acmaea chathamensis* Pilsbry, Man. Conch., vol. 13, p. 56, pl. 35, figs. 43-46.
1933 *Cellana chathamensis*: Powell, Rec. Auck. Inst. Mus., vol. 1 (4), p. 196, pl. 36, figs. 1-4.
1955 *Cellana strigilis chathamensis*: Powell Dept. Sci. and Indust. Res., Cape Exped. Ser., Bull. no. 15, p. 73.

Types—The type material is in the Academy of Natural Sciences of Philadelphia.

Records—NEW ZEALAND: CHATHAM ISLANDS (type): Waitangi (AWBP coll.); Wharekauri (AWBP coll.); Tioriori (Auck. Mus.); Waikare Bay, Pitt Island (Auck Mus.).

Cellana strigilis
subspecies *flemingi* Powell, 1955

(Pl. 168, fig. 3; pl. 169, figs. 5-7)

Range—Snares Islands, southern New Zealand.

Remarks—This subspecies is more closely allied to typical *strigilis* than it is to *redimiculum*, from both of which it differs in its consistently more narrowly oval shape, high arched profile, and anterior position of the nucleus.

Description—Shell of small to medium size, up to 53 mm. (2½ inches) in length, narrowly ovate, with the apex varying between the anterior fourth to fifth in adults, but one eighth or less in juveniles. Anterior slope straight, but posterior slope prominently arched, and flattened on top

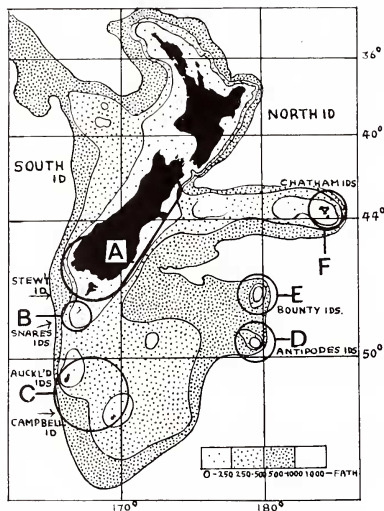


Plate 166. Distribution of *Cellana strigilis* and its subspecies. An example of an otherwise warm-water genus, surviving cooling temperatures in southern New Zealand, and represented as relict subspecies in the isolated southern islands, once part of a greater New Zealand land mass.

- A—*Cellana strigilis redimiculum* (Reeve), South Island and Stewart Id. Note northern limit near top of South Island east coast.
B—*Cellana strigilis flemingi* Powell, Snares Islands.
C—*Cellana strigilis strigilis* (Hombron & Jacquinot), Auckland Islands and Campbell Island.
D—*Cellana strigilis bollosi* Powell, Antipodes Islands.
E—*Cellana strigilis oliveri* Powell, Bounty Islands.
F—*Cellana strigilis chathamensis* (Pilsbry), Chatham Islands. (Chart adapted from Fleming, 1951, N. Z. Science Review, 9 (10), p. 167).

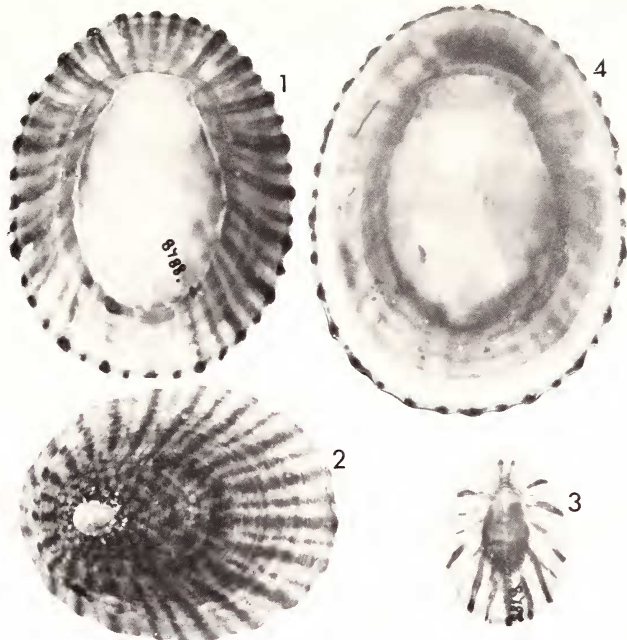


Plate 167. Figs. 1-4. *Cellana strigilis* subspecies *chathamensis* (Pilsbry, 1891). Waitangi, Chatham Islands, 21-71 mm., AWBP coll. 8786, 8788.

for about one third of the length. Sculpture consisting of about 25 narrowly rounded primary radials, and a few very weak intermediates. Young shells have the radials as scarcely raised folds, crossed by dense concentric growth lines. Colour of exterior almost uniformly olive-brown, except for the nuclear area to about 15 mm., which is dark-brown, with a light bluish ocellate pattern in the rib interstices; interior metallic dull smoky-grey, with a dark brown internal rib pattern showing through the glaze, and coalescing at the margin, in adults, to form an almost continuous border; spatula buff, tinged posteriorly with pale reddish brown.

Measurements (mm.)—

length	width	height	
53.00	41.5	22.00	holotype
47.00	35.5	18.50	paratype
28.75	21.0	7.00	paratype
21.25	15.0	4.25	paratype
17.75	12.5	3.40	paratype

Synonymy—

1955 *Cellana strigilis flemingi* Powell, Cape Exped. Ser., Bull. no. 15, p. 72, pl. 5, figs. 45-47

*Types—*The holotype and paratypes are in the New Zealand Geological Survey, Wellington.

*Records—*SNARES ISLANDS: boat harbour, on intertidal rocks.

***Cellana strigilis*
subspecies *oliveri* Powell, 1955**

(Pl. 165, figs. 3-5)

*Range—*Bounty Islands, southern New Zealand.

*Remarks—*This subspecies is easily recognised by its narrowly ovate and depressed shape, with the apex at, or near to, the anterior end, and a bold pattern of radial streaks and blotches.

*Description—*Shell of small to medium size, up to 57.5 mm. (2¼ inches) in length, solid, rather narrowly ovate and depressed, the apex near to the anterior margin at all stages of growth. From

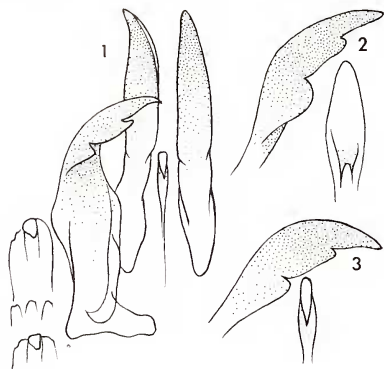


Plate 168. Radulae of New Zealand *Cellana*. Fig. 1. *Cellana strigilis* (Hombon & Jacquinot), Campbell Island. Fig. 2. *Cellana strigilis chathamensis* (Pilsbry), Wharekauri, Chatham Island. Fig. 3. *Cellana strigilis flemingi* Powell, Snares Islands. In Figs. 2 and 3 the lateral, in semi-profile, and the median vestigial central only, are shown.

20 to 25 broadly rounded radial ribs, with an occasional weak interstitial one; surface smooth, apart from weak growth lines. Colour of exterior bluish-white, heavily blotched and streaked with light to dark-brown, the pattern frequently running together, leaving elongated patches of the pale ground colour; interior pale amber, with the external pattern showing through in dark brown; spatula dark-brown in young shells, to clouded with buff or pale-brown in adults.

Measurements (mm.)—

length	width	height	
57.5	45.00	20.00	paratype
41.0	29.00	10.50	holotype
35.0	24.00	7.00	AWBP coll.
27.3	20.10	6.00	paratype
16.5	10.5	4.00	AWBP coll.

Synonymy—

1955 *Cellana strigilis oliveri* Powell, Dept. Sci. and Indust. Res., Cape Exped. Ser., Bull. no. 15, p. 73, pl. 5, figs. 48-50.

*Types—*The holotype and paratypes are in the Dominion Museum, Wellington.

*Records—*BOUNTY ISLANDS (Domin. Mus., Wellington), (AWBP coll.)

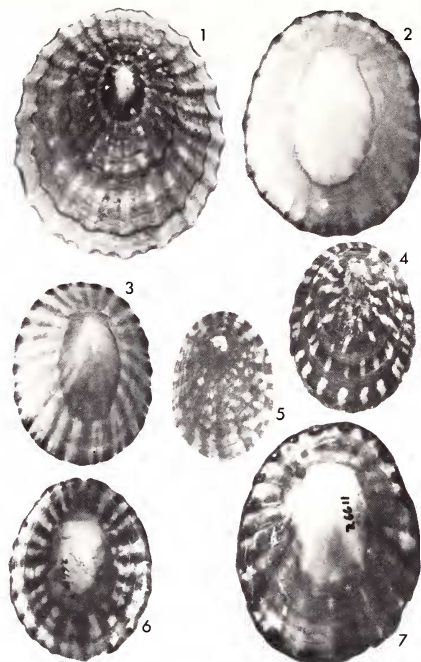


Plate 169. Figs. 1-4. *Cellana strigilis* subspecies *redimiculum* (Reeve, 1854), New Zealand. Fig. 1. Stewart Island, 78 mm., AWBP coll. 40089. Figs. 2-4. Kartigi Beach, North Otago, 30-62 mm., AWBP coll. 6874. Figs. 5-7. *Cellana strigilis* subspecies *flemingi* Powell, 1955, Snares Islands, southern islands of New Zealand, 30-50 mm., AWBP coll. 26611.

Cellana strigilis
subspecies ***redimiculum*** (Reeve, 1854)

(Pl. 70, figs. 17-19; Pl. 169, figs. 1-4)

*Range—*NEW ZEALAND: Stewart Island, eastern and western Otago, and east coast of South Island as far north as Kaikoura.

*Remarks—*This is the common South Island mainland subspecies of *strigilis*, easily recognised by its orange-brown exterior, with pale blue ocellate flecks in the rib interstices, and internally, by the dark brown radials, that do not anastomose at the margin. The centre of distribution is eastern Otago, where it is a common intertidal limpet.

Description—Shell rather large, up to 77 mm. (3 inches) in length, solid, broadly ovate, elevated, with the apex at about the anterior fourth or fifth. Sculpture consisting of about 20 strong rounded radial ribs, mostly with a much weaker radial in each interspace; the whole surface crossed by dense weak concentric growth lines. Colour of exterior orange-brown, with pale blue ocellate flecks and streaks in the radial interspaces; interior yellowish to greyish-brown, with a golden sheen, and the external rayed pattern showing through; spatula chestnut coloured, often clouded with a greyish callus. The margin bears a regular series of dark brown spots, marking the terminal points of the external primary radials.

Measurements (mm.)— (all A.W.B. Powell collection).

length	width	height	
77.0	65.0	33.0	Stewart Island
66.5	55.0	30.0	Kartigi
51.5	43.0	21.0	Kartigi
48.0	36.0	14.0	Kartigi
30.0	22.0	10.0	Kartigi
35.5	27.5	10.5	Goose Bay

Synonymy—

- 1854 *Patella radians* Gmelin, Reeve, Conch. Iconica, pl. 12, figs. 25a, b. (non Gmelin, 1791).
 1854 *Patella redimiculum* Reeve, Conch. Iconica, pl. 20, figs. 50a, b.
 1873 *Patella pottsii* Hutton, Cat. Mar. Moll. N.Z., pp. 44.
 1891 *Helcioniscus redimiculum* Reeve, Pilsbry, Man. Conch., vol. 13, p. 136, pl. 23, figs. 1,2,3,5.
 1913 *Helcioniscus strigilis* (in part, non Hombron and Jacquinot, 1841); Suter, Man. N. Z. Moll., p. 87.
 1913 *Helcioniscus redimiculum* (in part); Suter, Man. N. Z. Moll., p. 85.
 1927 *Nacella redimiculum* Reeve, Finlay, Trans. N. Z. Inst., vol. 57, pp. 337, 338.
 1955 *Cellana strigilis redimiculum* Reeve, Powell Dept. Sci. and Indust. Res., Cape Exped. Ser., Bull. no. 15, p. 71.

Types—The type of *redimiculum* is in the British Museum (Natural History).

Records—NEW ZEALAND: South Island: Goose Bay, Kaikoura; Oamaru; Kartigi Beach, Otago; Waikouaiti, Otago; Portobello, Dunedin; St. Clair, Dunedin (all AWBP coll. 280); entrance to Milford Sound (Galathea Exped., Sta. 624); Henrietta Bay, Ruapeke Island, Foveaux Strait (Auck Inst.); Stewart Island (AWBP coll.); Blind Passage, Port Pegasus (Auck. Inst.).

Cellana thomsoni Powell and Bartrum, 1929

(Pl. 171, fig. 1)

Range—New Zealand, lower Miocene.

Remarks—The species is unlike any other New Zealand member of the genus, but bears some resemblance to the Japanese Recent *toreuma* Reeve. In the Japanese species, however, the radials are not so strongly or so numerous beaded.

Description—Shell small, 14 mm. (9/16 of an inch) in length, but probably attained a much larger size, elongate-ovate, depressed, with the apex at about the anterior sixth. Sculpture consisting of about 36 primary narrowly rounded radials, and 1 to 3 secondary radials in the interspaces. The whole surface is crossed by very numerous concentric lamellose growth lines, that thicken to become knotted or beaded where they cross the radials.

Measurements (mm.)—

length	width	height	
14.0	10.0	21.1	holotype

Synonymy—

- 1929 *Cellana thomsoni* Powell and Bartrum, Trans. N. Z. Inst., vol. 59, p. 413, pl. 35, fig. 12.

Types—The holotype, the only known specimen, is in the Geology Department, University of Auckland.

Records—NEW ZEALAND: Waiheke Island, Oneroa Beds, Waitemata Group, Otaian Stage, lower Miocene.

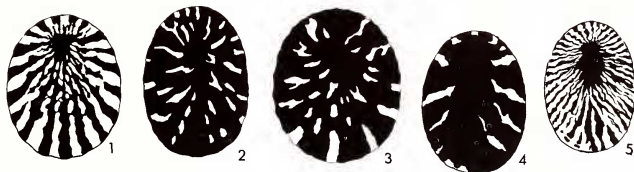


Plate 170. Juvenile colour patterns, by transmitted light, in New Zealand *Cellana strigilis* and subspecies. Fig. 1. *C. strigilis redimiculum* (Reeve), Oamaru, South Island. Fig. 2. *C. strigilis flemingi* Powell, Snares Islands. Fig. 3. *C. strigilis*

strigilis (Hombron & Jacquinot), Auckland Islands. Fig. 4. *C. strigilis oliveri* Powell, Bounty Islands. Fig. 5. *C. strigilis bollonsi* Powell, Antipodes Islands. The line is drawn through the apices.



Plate 171. Fig. 1. *Cellana thomsoni* Powell & Bartrum, 1929, New Zealand, Waikato Island, Auckland, Otaian, lower Miocene, 14 mm., holotype.

Cellana cophina Powell, new species

(Pl. 172, fig. 1)

Range—New Zealand. Cape Rodney, Hauraki Gulf (holotype), and coast $\frac{1}{2}$ mile east of Goat Island, Cape Rodney (paratype). Motutapu Island, Auckland; all in either coarse sandstone or conglomerate, basal Waitemata Beds, Otaian, lower Miocene.

Remarks—This strongly sculptured species is nearest allied to the Recent *denticulata* (Marty, 1784), from which it differs in that both the radial ribs and the concentric cords are so strong that a coarse basket-weave effect results.

Description—Shell rather large, 60 to 70 mm. ($2\frac{3}{4}$ — $2\frac{7}{8}$ inches) in length, narrowly ovate and of low profile, with the apex at about the anterior third. Sculpture very strong, like a coarse basket-weave, consisting of about 20 strong rounded radials, without intermediates, and crossed by closely spaced prominent cords that are much thickened where they cross the radials, but weak in the interspaces.

Measurements (mm.)—Estimated size in parentheses.

length	width	height	
55.0 (57.0)	43.5 (47.0)	(15.0)	holotype
65.0 (70.0)	16.0	(16.0)	paratype

Types—Holotype and paratype in the collection of the New Zealand Geological Survey, Wellington. The type locality is Cape Rodney, Hauraki Gulf, New Zealand.

Cellana taberna Powell, new species

(Pl. 172, fig. 2)

Range—New Zealand. Curiosity Shop, Rakaia, South Island, Waitakian greensands, lower Miocene.

Remarks—This shell has distinctive sculpture, unlike that of any of the described species from New Zealand or elsewhere. The sculpture differs from that of *C. cophina* in that it is a combination of large irregularly-oval, smooth blisters on the primary radials with much weaker and more regular interstitial riblets that are cut into small, squarish nodes by deeply-incised concentric grooves.

Description—Shell small, probably not adult, 23 mm. ($\frac{7}{8}$ of an inch) in length, narrowly ovate, and of low profile, with the apex at the anterior third. Sculpture very strong, consisting of about 13 prominent rounded primary radials that develop large ovate smooth blisters, stronger posterior to the apex. Interstices with from 2 to 5 secondary radials, crossed by deeply incised concentric grooves, cutting them into series of small rectangular nodes.

Measurements (mm.)—

length	width	height	
22.5	17.25	6.25	holotype

Type—The unique holotype is in the collection of the New Zealand Geological Survey, Wellington. The type locality is stated in the range above.



Plate 172. Fig. 1. *Cellana cophina* new species, New Zealand, Cape Rodney, Hauraki Gulf, North Island, Otaian, lower Miocene; holotype, 55 (57) mm. Fig. 2. *Cellana taberna* new species, New Zealand, Curiosity Shop, Rakaia, South Island, Waitakian greensands, lower Miocene; holotype, 22.5 mm.

Genus *Nacella* Schumacher, 1817Type *Patella mytilina* Helbling, 1779

This genus and its subgenus *Patinigera* are characteristic molluscs of Antarctic and Subantarctic seas. They have their centre of distribution in the Magellanic Province of southern South America from whence the seaweed-dwelling species in particular tend to spread eastward, being assisted to a considerable extent by the prevailing West Wind Drift that operates strongly in the Subantarctic Zone.

Although *Nacella* and *Patinigera* are not members of the Indo-Pacific fauna, the recognised species are listed and briefly described here, since many of them do occur in waters to the south of both the Indian and Pacific Oceans, and at one location, Campbell Island, in the New Zealand faunal area, both *Nacella* (*Patinigera*) and the warmer-water derived *Cellana* flourish side by side.

Both *Nacella* and *Patinigera* differ from all other Patellidae in the presence of an epipodial fringe, a scalloped lamellate flange that occupies a mid position between the edge of the foot and the gill cordon, except where it is interrupted by the head region.

There is a link with *Patella* in that the gill cordon is complete, not interrupted by the head as it is in *Cellana*. The dentition, on the other hand, with its pair of centrals, alternating with a pair of laterals, is comparable with that of *Cellana*, not short, straight and bent back upon itself at the nascent end as it is in *Patella*.

Thiele in 1929 proposed the subfamily Nacellinae for *Nacella*, *Patinigera* and *Cellana*, but the epipodial fringe, characteristic of *Nacella* and its subgenus *Patinigera*, is not found in *Cellana* or in any other patellid genus.

The radula, on the other hand, is very similar in all three of the above mentioned taxa, but very different from that of the Patellinae.

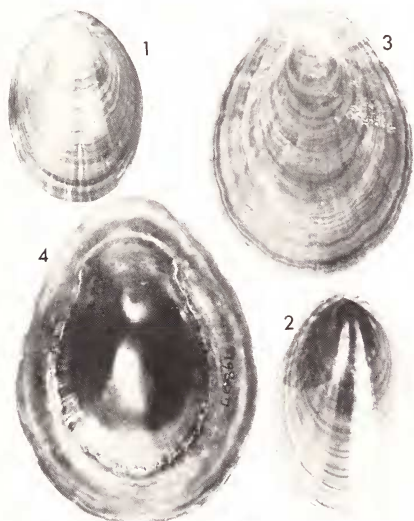


Plate 173 Figs. 1, 2 *Nacella mytilina* (Helbling, 1779). Mouth of Santa Cruz River, Patagonia, 27-29 mm., AWBP coll. 42389. Figs. 3, 4. *Nacella kerguelensis* (E. A. Smith, 1877). Fig. 3. Swain's Bay, Kerguelen Island, 43 mm., AWBP coll. 30635. Fig. 4. Heard Island, 64 mm., AWBP coll. 40861.



Plate 174 Fig. 1. *Nacella mytilina* (Helbling), Kerguelen Island. Radula, from Thiele, in Troschel & Thiele, 1891, pl. 28, fig. 30. Fig. 2. *Nacella (Patinigera) deaurata* (Gmelin), Tuesday Bay. Radula, from Thiele, in Troschel & Thiele, 1891, pl. 28, fig. 32. Fig. 3. *Nacella (Patinigera) terroris* (Filloff), Campbell Island. Radula.

Description—Shell rather small to moderately large, thin and fragile, typically elliptical, high-arched, with the apex strongly curved forward and downward, sometimes almost at the anterior end. The surface is smooth, or occasionally weakly radially ridged. Colour pale-olive to brownish, the apex coppery; inside silvery iridescent to reddish bronze. The species live mostly attached to large seaweeds, and range from southern Chile and Argentina to the Kerguelen Island.

Synonymy—

1817 *Nacella* Schumacher, Essai d'un Nouveau Systeme des Habitations, p. 179. Type, by subsequent designation, Gray, 1847: *Patella mytilina* Helbling, 1779.

Nacella mytilina (Helbling, 1779)

(Pl. 73, fig. 9; Pls. 173, 174)

Range—Southern Chile, Straits of Magellan, Tierra del Fuego, Falkland Islands and Kerguelen Island.

Description—Shell rather small, up to 43 mm. (1½ inches) in length, elliptical, thin and fragile, with the apex almost at the anterior end. Usually the surface is almost smooth, but occasionally moderate radial ridges are developed, as well as corrugations around the anterior margin. Colour greenish olive to light brownish, sometimes reddish bronze at the apex, and the interior is silvery iridescent.

Measurements (mm.)—(all A.W.B. Powell collection).

length	width	height	
43.0	26.0	18.0	Punta Arenas
34.5	23.0	11.0	Falkland Islands
27.0	18.0	7.5	Hermut Id., Cape Horn

Synonymy—

1779 *Patella mytilina* Helbling, Abh. Privatges. Bolm., vol. 4, p. 104, pl. 1, figs. 5, 6.

1786 *Patella mytiliformis* Lightfoot, Cat. Portland Mus., p. 42.

1791 *Patella conchacca* Gmelin, Syst. Nat. ed. 13, p. 3708.

1817 *Nacella mytiloides* Schumacher, Essai Vers. test., p. 179.

1819 *Patella cymbularia* Lamarck, Anim. sans Vert., vol. 6, p. 335.

1831 *Patella cymbuloides* Lesson, Voy. de la Coquille, p. 422.

1845 *Patella hyalina* Philippi, Arch. f. Naturg., vol. 11, p. 59.

1845 *Patella cymbium* Philippi, Arch. f. Naturg., vol. 11, p. 60.

1845 *Patella vitrea* Philippi, Arch. f. Naturg., vol. 11, p. 60.

1869 *Nacella compressa* Rochebrune & Mabille, Mission scient. Cap Horn, vol. 6, p. 98, pl. 5, fig. 9.

1913 *Nacella falklandica* Preston, Ann. Mag. Nat. Hist., ser. 8, vol. 11, p. 221, pl. 4, fig. 6.

1950 *Nacella mytilina* Helbling, Carcelles, Anales del Museo Nahuel Huapi, vol. 2, p. 52 (Kerguelen).

1951 *Nacella mytilina* Helbling Powell, Discovery Rep., vol. 26, p. 80.

1964 *Nacella mytilina* Helbling, Dell. Rec. Domin. Mus., vol. 4, no. 20, p. 273.

Records—STRAITS OF MAGELLAN (type locality): Punta Arenas, St. Martin's Cove, Hermite Island, Cape Horn. PATAGONIA: mouth of Santa Cruz River. FALKLAND ISLANDS (all AWBP coll.). KERGUELEN ISLAND: Swain's Bay, intertidal and Antares Island, intertidal (BANZARE Sta. 48 and Sta. 61).

Nacella kerguelensis (E. A. Smith, 1877)

(Pl. 73, fig. 10; Pl. 173, figs. 3, 4)

Range—Kerguelen Island, Heard Island and Macquarie Island.

Remarks—Dell (1964) has shown that the young stages of this species have the form of typical *Nacella*, and that in the adult the apex has moved back from near the front margin to a subcentral position. These adults, however, retain the light build of *Nacella*. It is possible that some of the lighter built Magellanic species of *Patina* go through a *Nacella* stage also, but at present there is no evidence in support of this theory.

The Macquarie Island record is based upon four beach shells, and none have been recorded since from that locality, so it is assumed that the original specimens may have drifted there upon floating kelp.

Description—Shell thin and fragile, large, up to 80 mm. (3½ inches) in length, broadly ovate, but decidedly narrowed anteriorly, rather everted, and with the apex varying between near the front margin in juveniles to a subcentral position in adults. Sculpture consisting of weak radial folds. Colour dark purplish-brown, with the apex reddish-bronze; internally completely dark bronzy reddish-brown.

Measurements (mm.)—

length	width	height	
80.0	65.5	33.0	Heard Island: Dell, 1964
67.0	57.0	24.0	Royal Sound, Kerguelen
46.0	37.0	15.6	Royal Sound, Kerguelen

Synonymy—

1877 *Patella* (*Patina*) *kerguelensis* E. A. Smith, Phil. Trans. Roy. Soc. London, vol. 168, p. 177, pl. 19, figs. 13, 13a. (Kerguelen Island).

1886 *Patella kerguelensis* Smith, Watson, Challenger Rep., vol. 15, p. 27.

1908 *Patina kerguelensis* Smith, Strebel, Schwed. Sudpol. Exped., Zool., vol. 6, p. 83.

1916 *Nacella kerguelensis* Smith, Hedley, Aust. Ant. Exped. 1911-1914, ser. C, vol. 4, pt. 1, p. 44. Macquarie Island.

1957 *Patinitigra kerguelensis* Smith, Powell, B.A.N.Z. Ant. Res. Exped., vol. 6, p. 126.

1964 *Nacella kerguelensis* Smith, Dell. Rec. Domin. Mus., vol. 4, no. 20, p. 276.

Subgenus *Patinigera* Dall, 1905

Type: *Patella magellanica* Gmelin, 1791

Shells of the subgenus are mostly more solid than those of typical *Nacella*. They have the apex well back from the anterior end, sometimes being subcentral in position. The interior is always with a bronze lustre. As in typical *Nacella*, the gill cordon is complete and there is a well-developed epipodial fringe. The radula shows no important differences.

The subgenus is more widely distributed than is typical *Nacella*. It extends up the western coast of South America as far as Valparaiso, and southward to the subantarctic islands and Antarctica. It also occurs at Macquarie Island, and reaches its furthest north location in the New Zealand faunal region at Campbell Island, 52° 33'S.

Synonymy—

- 1871 *Patinella* Dall, Proceedings of the Boston Society of Natural History, vol. 14, p. 53. Type by original designation: *Patella magellanica* Gmelin, 1791.
1905 *Patinigera* Dall, Nautilus, vol. 18, no. 10, nom. nov. pro *Patinella* Dall, 1871, non Gray, 1848.

Nacella clypeater (Lesson, 1831)

(Pl. 73, fig. 13; Pl. 175, figs. 1-2)

Range—Chile, to as far north as Valparaiso.

Remarks—The species is easily recognised by its nearly circular outline.

Description—Shell of moderate size, up to 61 mm. (2½ inches) in length, rather depressed and almost circular in outline, with the apex subcentral. Sculpture consisting of very numerous, regular, narrow, low rounded, radial ribs. Colour dull reddish-brown, the ribs paler; interior silvery to pale bronze, with the spatula area irregularly blotched with dark reddish-brown.

Measurements (mm.)—

length	width	height	
61.0	58.0	14.5	Chile; Pilsbry, 1891
56.5	51.0	17.0	Chile
47.0	43.5	14.5	Chile
37.0	32.0	9.0	Valparaiso

Synonymy—

- 1831 *Patella clypeater* Lesson, Voy. Coquille, Zool., vol. 2, p. 419.
1854 *Patella clypeater* Lesson, Reeve, Conch. Iconica, pl. 16, figs. 35 a, b. "Monterey, California," in error.
1891 *Nacella* (*Patinella*) *clypeater* Lesson, Pilsbry, Man. Conch., vol. 13, p. 122, pl. 50, figs. 40-43.

Nacella concinna (Strebel, 1908)

(Pl. 176, figs. 1-5)

Range—South Georgia, South Orkneys, South Shetlands, Bouvet Island, Seymour Island, Paulet Island, Wandel Island, Anvers Island and Petermann Island.

Remarks—Unfortunately the well-known name of this species, *Patella polaris* Hombrohn & Jacquinet, 1841, falls as a homonym of the same combination of Röding, 1798. However there is a substitute name available, in *Patinella polaris concinna* Strebel, 1908, from South Georgia, and this name, *concinna*, may be used specifically, since there appears to be no real difference between the shallow-water '*polaris*' and the deeper-water *concinna*, other than a gradual tendency towards lower profile, lighter build, more clear-

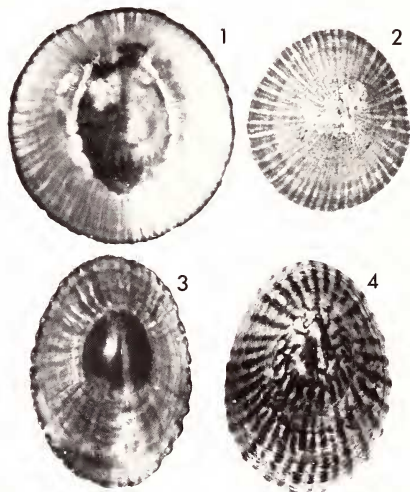


Plate 175. Figs. 1, 2. *Nacella* (*Patinigera*) *clypeater* (Lesson, 1831), Chile, 44-53 mm., AWBP coll. 461-45. Figs. 3, 4. *Nacella* (*Patinigera*) *deaurata* (Gmelin, 1791), Falkland Islands, 60 mm., AWBP coll. 632.

cut ribbing and paler coloration as the depth increases. Strebels' *concinna*, described as a *Patinella*, does not conflict with the Japanese acmaeid that was originally described as *Patella concinna* Lischke. The species lives from the intertidal zone down to 110 metres.

Description (shallow-water '*polaris*' form)—Shell moderately large, up to 60 mm. (2½ inches) in length, elongate ovate, rather thin, moderately elevated, with the apex between central and the anterior third. Sculptured with distant weak radial ribs in young shells, but the ribbing becomes subobsolete to obsolete in the adult. Colour, externally pale brownish; internally very

dark bronzy-brown, almost black, the spatula sometimes a paler chestnut-brown.

Description (deeper-water typical form)—Shell usually small, 20 to 32 mm. (¾ to 1¼ inches) in length, thin and fragile, elongate ovate, moderately elevated and with the apex at about the anterior third. Sculptured with about 28 to 30 narrow radial ribs, crossed by dense fine lamellose growth lines. Colour buff, sparingly blotched in reddish brown; interior cream, shining, variably maculated with pale reddish brown. Some larger examples, approaching the larger shallow-water form in size, tend to flatten out at the margin, towards which the radial sculpture becomes subobsolete.

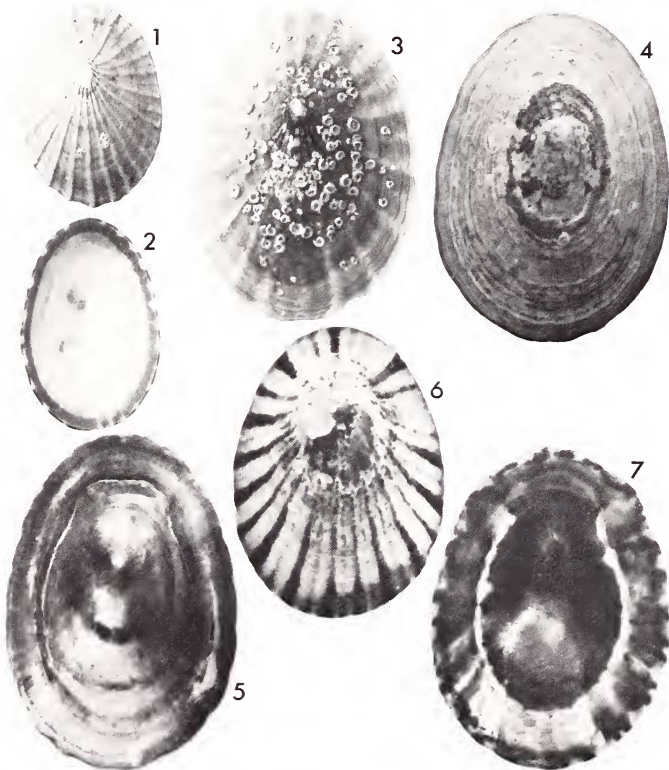


Plate 176. Figs. 1-5. *Nacella (Patinigera) concinna* (Strebels, 1908). Figs. 1, 2 (*concinna* form), East Cumberland Bay, South Georgia, 27 metres, 27 mm., AWBP coll. Fig. 3. East Cumberland Bay, 24-30 metres, 41 mm., AWBP coll. 26831. Figs. 4, 5 (*polaris* form), Melchior Island, Schollaert Channel,

Palmer Archipelago, 4-10 metres, 58 mm., AWBP coll. 52493. Figs. 6, 7. *Nacella (Patinigera) delesserti* (Philippi, 1849), Marion Island, south western Indian Ocean, 35-53 mm., AWBP coll. 52491.

Measurements (mm.)—

length	width	height	
58.0	42.0	19.0	Palmer Archipelago, 4-10 metres: (' <i>polaris</i> ' form)
44.0	31.0	18.5	S. Orkneys (' <i>polaris</i> ' form)
42.0	29.0	9.0	S. Georgia, 27 metres: (intermediate form)
31.0	21.5	11.0	S. Georgia (' <i>polaris</i> ' form)
29.0	20.0	8.0	S. Georgia, 18 metres: (typical <i>concinna</i>)
25.0	17.0	6.25	S. Georgia (typical <i>concinna</i>)

Synonymy—

- 1841 *Patella polaris* Hombron & Jacquinot, Ann. Sci. Nat. Zool., vol. 16, p. 191 (non Röding, 1798).
 1886 *Patella polaris* H. and J. Martens and Pfeffer, Moll. Süd-Georgien, J. hamb. wiss. Anst., vol. 3, p. 101, pl. 2, figs. 11-13.
 1891 *Nacella (Patinella) polaris* H. and J. Pilsbry, Man. Conch., vol. 13, p. 120, pl. 49, figs. 21-27.
 1908 *Patinella polaris* H. and J. Strebel, Wiss. Ergeb. schwed. Südpolar-Exped. (1901-3), vol. 6, p. 81, pl. 5, fig. 77.
 1908 *Patinella polaris concinna* Strebel, Wis. Ergeb. schwed. Südpolar-Exped. (1901-3), vol. 6, p. 82, pl. 5, figs. 76 a-c, 78 a, b.
 1951 *Patinigera polaris* H. and J. Powell, Discovery Rep., vol. 26, p. 82.
 1951 *Patinigera polaris concinna* Strebel, Powell, Discovery Rep., vol. 26, p. 83.

Records—SOUTH GEORGIA (type of '*polaris*'): Cumberland Bay, 15-25 metres (type of *concinna*); East Cumberland Bay, 18-110 metres; Moltke Harbour, in rock pool; Stromness Harbour, 26-35 metres; Undine Harbour, 18-27 metres. SOUTH ORKNEYS: Signy Island, 18-27 metres; Normanna Strait, 24-36 metres ('Discovery II'; Powell, 1951). SOUTH SHETLANDS: Deception Island, 5-60 metres; Nelson Island, shore; Livingston Island, shore; Wilhelmia Bay, Danco Land, 1-8 fathoms ('Discovery II'; Powell, 1951). PALMER ARCHIPELAGO: Melchior Island, 4-10 metres. Bouvet Island, 40-45 metres ('Discovery II'; Powell, 1951). Seymour, Paulet, Wandel, Anvers and Petermann Islands (Strebel, 1908; Lamy, 1911).

***Nacella deaurata subspecies deaurata*
(Gmelin, 1791)**

(Pl. 73, fig. 11; Pls. 174, 175)

Range—Southern Patagonia, Straits of Magellan, Tierra del Fuego and Falkland Islands.

Remarks—The species is nearest allied to *magellanica* which is more broadly ovate in outline and lacks nodulation of the radials.

Description—Shell of moderate size, up to 61 mm. (2½ inches) in length, rather solid, tall conical, narrowly ovate, and with the apex at about the anterior third. Sculpture consisting of from 36 to 40 strong radial ribs, which are rendered strongly scabrous to nodular by numerous overriding concentric lamellose lirae. Colour yellowish-brown to reddish-brown, tending dark reddish-brown to bronze over the apical area.

Interior silvery with a pinkish lustre, more or less rayed and mottled with reddish-bronze, the spatula and spotted marginal border dark reddish-brown.

Measurements (mm.)—

length	width	height	
61.0	43.0	27.0	Falkland Islands
57.0	43.0	24.0	Falkland Islands
48.0	34.0	19.5	Falkland Islands

Synonymy—

- 1784 *Patella aenea* Martyn, Univ. Conch., vol. 1, fig. 17 (invalid).
 1791 *Patella deaurata* Gmelin, Syst. Nat. ed. 13, p. 3719, based upon Martini-Chenimitz, Conch. Cab., vol. 10, p. 327, pl. 168, figs. 1616 a, b.
 1854 *Patella varicosa* Reeve, Conch. Iconica, pl. 11, figs. 21 a-c.
 1885 *Nacella strigatella* Rochebrune and Mabille, Bull. Soc. Phil. Paris, ser. 7, vol. 9, p. 110.
 1891 *Nacella (Patinella) aenea* Martyn, Pilsbry, Man. Conch. vol. 13, p. 118, pl. 46, figs. 28-36.
 1913 *Helcioniscus benetti* Preston, Ann. Mag. Nat. Hist. ser. 8, vol. 11, p. 221, pl. 4, fig. 7.
 1951 *Patinigera aenea* Martyn, Powell, Discovery Rep., vol. 26, p. 82.

***Nacella deaurata form delicatissima*
(Strebel, 1907)**

(Pl. 178, figs. 3, 4)

Range—Straits of Magellan and Falkland Islands.

Remarks—This is a small thin shell of low profile with delicately squamose ribs, and of pale colour with a few rays and streaks of reddish-brown at most. The writer has insufficient material to properly evaluate this shell which may prove to grade into the typical species. It occurs from 5 to 50 fathoms.

Measurements (mm.)—

length	width	height	
46.7	36.9	15.8	Strebel, 1908, pl. 5, fig. 75
21.4	16.6	5.7	Strebel, 1908, p. 145.
15.0	10.75	3.25	Eddystone Rock, Falklands, 115 metres

Synonymy—

- 1907 *Patinella delicatissima* Strebel, Zool. Jahrb. Abt. Syst., Jena, vol. 25, p. 145, pl. 5, figs. 71, 72, 74, 75.
 1908 *Patinella delicatissima* Strebel, Wiss. Ergeb. schwed. Südpolar-Exped., vol. 6, pt. 1, pl. 1, figs. 75, 75a.
 1951 *Patinigera delicatissima* Strebel, Powell, Discovery Rep., vol. 26, p. 82.

Records—STRAITS OF MAGELLAN: 20-30 fathoms (type locality); Uschnaia, Tierra del Fuego, 1-2 fathoms (Strebel, 1908). FALKLAND ISLANDS: off Eddystone Rock, East Falkland Islands, 115 metres; entrance to Port Stanley, 10-16 metres; Sparrow Cove, Port William, 10.5-16 metres (Discovery 11, Sta. 51, 52 and 56).

***Nacella delesserti* (Philippi, 1849)**

(Pl. 176, figs. 6, 7)

Range—Marion Island (between South Africa and Antarctica).

Remarks—The writer has only two examples of this species available but they seem to represent a distinct species, characterised by an elongate ovate outline and simplicity of both sculpture and colour pattern. According to Hedley (1916, Aust. Ant. Exped., ser. C, vol. 4, pp. 42, 43) *delesserti* was based upon an immature shell of only 22 mm. in length. Reeve (1854, Conch. Iconica, sp. 40, pl. 17) named a shell from unknown locality, *Patella ferruginea*, basing it apparently, upon a manuscript species of Sowerby, and with *Patella delesserti* Philippi cited in its synonymy. However Reeve's figures are unlike any shell I have seen and certainly bear no resemblance to the Marion Island limpet.

Description—Shell of moderate size, up to 54 mm. (2½ inches) in length, elongate ovate, more narrowly rounded anteriorly and of moderate elevation, with the apex between the anterior

third and fourth. Sculpture consisting of about 24 low, carinated to rounded, radial folds and an occasional intermediate, the whole surface densely crossed by weak lamellose growth lines. Colour of exterior greyish-white, with most of the primary radials dark reddish-brown. Interior heavily blotched and radially streaked in dark reddish-bronze. Spatula very large.

Measurements (mm.)—

length	width	height	
53.0	40.0	16.0	Marion Island
38.0	27.5	13.0	Marion Island

Synonymy—

1849 *Patella delesserti* Philippi, Abbild. Conch. vol. 3, pt. 4, p. 9, pl. 1, fig. 5.

***Nacella edgari* (Powell, 1957)**

(Pl. 177, figs. 3, 4; pl. 179)

Range—Kerguelen Island.

Remarks—The adult shell is very thin and fragile, almost flat to slightly concave, with an animal too large to allow the shell tight contact with the surface of the kelp. Young examples sometimes occur on rocks, and such have a slight elevation, as well as crisp narrow radials, but these become

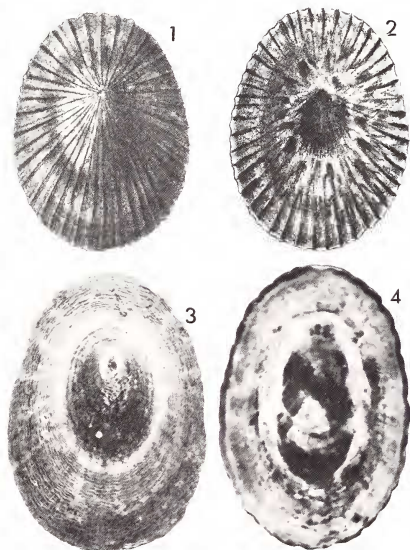


Plate 177. Figs. 1, 2. *Nacella (Patimigera) fuengiensis* (Reeve, 1855), "Tierra del Fuego, Falkland Islands,; from Reeve, 1855, pl. 28, fig. 73. Figs. 3, 4. *Nacella (Patimigera) edgari* (Powell, 1957), Royal Sound, Kerguelen Island, in fish trap, 34 mm., AWBP coll.

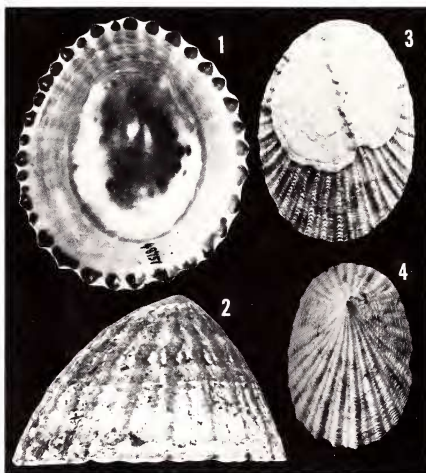


Plate 178. Figs. 1, 2. *Nacella (Patimigera) magellanica* (Gmelin, 1791), Straits of Magellan, 51 mm., AWBP coll. 45751). Figs. 3, 4. *Nacella (Patimigera) deaurata* subspecies *delicatissima* (Strebel, 1907), Falkland Islands, 115 metres, 16 mm., AWBP coll.

subobsolete as the shell grows and flattens out at the edges. It is associated with kelp from intertidal to about 55 metres.

Description—Shell elongate-ovate, of moderate size, up to 51 mm. (2 inches) in length, very thin and fragile, and very depressed, only the apical area slightly raised, and much of the remaining dorsal surface actually concave. Sculpture consisting of many radial folds, that are narrow at first but soon become broad and low, almost disappearing towards the margin in adults. The whole surface crowded with sharp concentric lamellae that undulate as they cross the radials. Colour dull-slate externally, tinged with bronze at the apex; internally, iridescent bluish grey, with the spatula and an irregular marginal border diffused reddish brown.

Measurements (mm.)—(All station numbers are of the British, Australian and New Zealand Antarctic Research Expedition, 1929-1931).

length	width	height	
51.0	33.0	8.0	holotype; Royal Sound, 20 metres. Sta. 5
43.0	30.5	3.5	Colbeck Passage, 20 metres. Sta. 55a.
40.0	27.5	4.5	Royal Sound, 1.5 metres. Sta. 55b.
38.0	26.5	10.5	Swain's Bay, intertidal. Sta. 48.

Synonymy—

- 1877 *Patella (Patinella) fuegiensis* Reeve, E. A. Smith, Phil. Trans. Roy. Soc. London for 1879 (issued separately 1877), vol. 168, p. 180, pl. 9, figs. 14, 14a. Not Reeve, 1855.
- 1891 *Nacella (Patinella) fuegiensis* Reeve, Pilsbry, Man. Conch. vol. 13, p. 121 (in part, pl. 49, figs. 28, 29 only). Not Reeve, 1855.
- 1957 *Patimigra fuegiensis edgari* Powell, B.A.N.Z. Ant. Res. Exped., vol. 6, pt. 7, p. 127, text figs. 1, 1a, 1b.

Types—The holotype and paratypes are at present in the Auckland Museum.

Records—KERGUELEN ISLAND, thirteen B.A.N.Z.A.R.E. Stations from in and around Royal Sound, ranging from low tide to 55 metres. The type locality is Port Jeanne d'Arc, Royal Sound, 20 metres, along the lower edge of the kelp belt.



Plate 179. *Nacella (Patinigra) edgari* (Powell, 1957). Grotto Bay, Port Jeanne d'Arc, Kerguelen Island, 10 metres, 37.5 x 25.5 x 4 mm. In profile to show the very slight elevation of the shell.

Nacella flammea (Gmelin, 1791)

(Pl. 181)

Range—Straits of Magellan.

Remarks—This shell resembles *fuegiensis* in its narrowly oval outline, moderate elevation, and light build, but differs in sculpture, the radials being almost obsolete, represented at most by broad very weak radial folds towards the margin. The colour pattern is of broad irregular axial streaks upon a whitish ground.

Description—Shell elongate-ovate, of light build, and of moderate size, up to 40 mm. (1½ inches) in length, moderately elevated, and with the apex at between the anterior third and fourth. Surface relatively smooth, just a few, almost obsolete, broad low radial folds over the posterior half of the shell, and only towards the outer margin. The only other sculpture consists of very faint concentric growth lines. External colour pattern of broad, flexuous, dark reddish brown axial streaks upon a whitish ground; internally, the colour pattern is the same, except for a bright chestnut spatula.

Measurements (mm.)—

length	width	height	
39.0	27.8	10.0	Strebel, 1907, p. 145
33.5	24.0	9.5	St. of Magellan
27.0	18.7	7.0	St. of Magellan

Synonymy—

- 1791 *Nacella flammea* Gmelin, Syst. Nat., ed. 13, p. 3716; based upon Martini-Chemnitz, Conch. Cab., 1, pl. 5, fig. 42.
- 1907 *Patinella flammea*: Strebel, Zool. Jahrb., 25 (1), p. 145, pl. 5, fig. 73.

Nacella fuegiensis (Reeve, 1855)

(Pl. 177, figs. 1, 2)

Range—Tierra del Fuego, Falkland Islands, Peterman Island and South Georgia.

Remarks—This is a thin-shelled, elongate-ovate species, with numerous, weak, almost smooth, radial ribs. It is of pale greenish ground colour, partially to almost entirely blotched with bronzy reddish brown. The somewhat similar *deaurata* is of stouter build and has the radials strongly scabrous.

Description—Shell elongate-ovate, of moderate size, up to 50 mm. (2 inches) in length, thin and fragile, moderately elevated and slightly laterally compressed. Sculpture consisting of numerous, narrow, sharply raised radials, in early stages of growth, but these tend to become broader and

lower towards maturity; the whole crossed by very dense sharp concentric lirae. Colour greenish grey, more or less blotched with reddish brown, and the apical area with a bronze lustre. Interior iridescent bronzy-brown, rayed with darker brown, corresponding to the external sculptural interspaces.

Synonymy—

- 1855 *Patella fucgiensis* Reeve, *Conch. Iconica*, pl. 28, figs. 73 a, b.
 1891 *Naella (Patinella) fucgiensis* Reeve, Pilsbry, *Man. Conch.*, vol. 13, p. 121, pl. 49, figs. 30, 31 (non figs. 28, 29).

Nacella magellanica subspecies magellanica
 (Gmelin, 1791)

(Pl. 73, figs. 14, 15; Pl. 178, figs. 1, 2)

Range—Tierra del Fuego, Straits of Magellan, Patagonia and Falkland Islands.

Remarks—This is the common limpet of the Magellanic Region, and it is easily recognised by its roundly oval shape, high-conical profile, nearly central apex, and strong unsculptured radial ribbing.

Description—Shell of moderate size, up to 65.6 mm. (2½ inches) in length, rather solid, roundly ovate and high-conical, with the apex erect and near central, strongly and regularly sculptured with relatively few bold rounded radials that deeply corrugate the margin. The concentric sculpture is confined to weak growth lines that do not render the radials either scabrous or beaded. Colour of exterior variable, pale reddish brown to greenish grey or brown, occasionally with broad dark-brown radial bands. Interior metallic-brown or leaden with the spatula bronzy-chestnut, and either a continuous or spotted marginal border of very dark-brown, the brown spots, when present, corresponding to the external ribs.

Measurements (mm.)—

length	width	height	
65.6	58.3	41.5	Strebel, 1907, fig. 94a
53.5	45.5	31.0	Straits of Magellan
45.0	37.5	21.5	Punta Arenas
33.0	27.0	18.0	Straits of Magellan
26.0	21.0	13.5	Straits of Magellan

Synonymy—

- 1791 *Patella magellanica* Gmelin, *Syst. Nat.*, ed. 13, p. 3703, based upon Gault, pl. 9, fig. E, and Martini-Chemnitz, *Conch. Cab.*, vol. 1, pl. 5, figs. 40 a, b.
 1854 *Patella magellanica* Gmelin, Reeve, *Conch. Iconica*, pl. 10, figs. 19 a, b.
 1854 *Patella atramentosa* Reeve, *Conch. Iconica*, pl. 17, figs. 41 a, b.
 1885 *Patella meridionalis* Rochebrune and Mabille, *Bull. Soc. Phil.*, Paris, ser. 7, vol. 9, p. 109.

- 1885 *Patella metallica* Rochebrune and Mabille, *Bull. Soc. Phil.*, Paris, ser. 7, vol. 9, p. 109.
 1885 *Patella pupillata* Rochebrune and Mabille, *Bull. Soc. Phil.*, Paris, ser. 7, vol. 9, p. 110.
 1885 *Patella tineta* Rochebrune and Mabille, *Bull. Soc. Phil.*, Paris, ser. 7, vol. 9, p. 110.
 1891 *Patinella aenea* var. *magellanica* Gmelin, Pilsbry, *Man. Conch.*, vol. 13, p. 119, pl. 44, figs. 9-17; pl. 43, figs. 1-6.
 1907 *Patinella magellanica-atramentosa* Strebel, *Zool. Jahrb. Abt. Syst. Jena*, vol. 25, p. 146, pl. 6, figs. 86-88; pl. 7, figs. 91, 92, 94, 95.
 1907 *Patinella aenea* var. *minor* Strebel, *Zool. Jahrb. Abt. Syst. Jena*, vol. 25, p. 137, pl. 5, figs. 67 a-d.
 1951 *Patinigera magellanica* Gmelin, Powell, *Discovery Rep.*, vol. 26, p. 81.

Nacella magellanica subspecies venosa (Reeve, 1854)

(Pl. 180, figs. 1-4)

Range—Chiloe Island, Chile.

Remarks—Both *venosa* and *chiloensis*, from the same locality, Chiloe Island, appear to represent but one form, a roundly ovate, high-conical, thin-shelled, sub-obsolete sculptured variant of *magellanica*, which, as suggested by Dell (l.c., 1964) may be a regional subspecies. Unfortunately the writer has no material available upon which to make further comment.

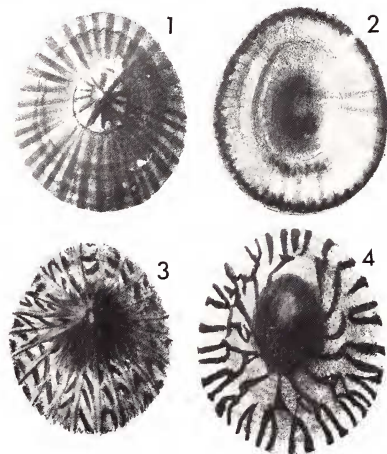


Plate 180. *Nacella (Patinigera) magellanica* subspecies *venosa* (Reeve, 1854) Chiloe Island, Chile. Figs. 1, 2. *Patella venosa* Reeve, 1854, *Conch. Iconica*, pl. 10, figs. 18 a, b. Figs. 3, 4. *Patella chiloensis* Reeve, 1855, *Conch. Iconica*, pl. 33, figs. 98 a, b.

Description—(original, for *venosa*) "Shell ovate, convex, rather high with age, a little contracted in front, in the young shell radiately ribbed, ribs small, rather distant, more or less obsolete with age, varicose near the margin; transparent-white, irregularly veined with chestnut-purple, veins bifurcated at the margin, deeply stained with purple-chestnut in the interior." Reeve's *chiloensis* is essentially similar in shape, height, sculpture and position of the apex, but differs in coloration, a minor point, in being irregularly stained and streaked in smoky-black.

Synonymy—

- 1854 *Patella venosa* Reeve, *Conch. Iconica*, pl. 10, figs. 18 a-c.
 1855 *Patella chiloensis* Reeve, *Conch. Iconica*, pl. 33, figs. 98 a, b.
 1964 *Patnigera magellanica venosa* Reeve, *Dell. Rec. Domin. Mus.*, vol. 4, no. 20, p. 273.

Nacella macquariensis Finlay, 1927

(Pl. 182, figs. 1, 2)

Range—Macquarie and Heard Islands.

Remarks—Compared with *terroris*, *macquariensis* varies greatly both in outline and in height; also it has fewer and stronger primary radials, a tendency to be longer and narrower, and the spatula is always clearly defined, often heavily callused. In *terroris* the shape is constantly broadly ovate and the spatula is never clearly defined.

Description—Shell moderately large, up to 63 mm. (2½ inches) in length, strong but of light build, mostly narrowly ovate and elevated, but varying to rather broadly ovate and depressed. Sculpture consisting of from 32 to 35 broadly rounded primary radial ribs, plus narrower secondary intermediate radials, mostly over the posterior half of the shell; the whole surface crowded with low concentric growth lamellae, that do not thicken to any extent on the crests of the radials. Colour, externally, olive to chestnut-brown; internally, diffused and strongly rayed in bronzy reddish brown, the spatula well-marked, variously blotched with reddish brown, and often almost completely white-callused.

Measurements (mm.)—

length	width	height	
63.0	51.9	31.2	Garden Cove, Dell, 1964
58.0	46.0	22.0	Macquarie Island
43.0	33.0	14.0	Hurd Point
41.0	35.0	17.0	Hurd Point
41.0	30.0	12.5	Hurd Point

Synonymy—

- 1913 *Nacella fuegiensis* Reeve, *Suter (in part)*, *Man. N. Z. Moll.*, p. 77. Not Reeve, 1855.
 1916 *Nacella delesserti* Philippi, *Hedley, Aust. Ant. Exped., ser. C*, vol. 4, pt. 1, p. 42, pl. 6, figs. 65-69. Not Philippi, 1849.
 1927 *Nacella macquariensis* Finlay, *Trans. N. Z. Inst.*, vol. 57, p. 337.
 1955 *Patnigera macquariensis* Finlay, *Dell. Rec. Domin. Mus.*, vol. 4, no. 20, p. 274.

Types—The type series, based upon Hedley's 1916 figures (pl. 6, figs. 65-69), is in the Australian Museum, Sydney.

Records—MACQUARIE ISLAND (AWBP coll.); Hurd Point (AWBP coll.); Aerial Cove and Garden Cove (Dell, 1964). HEARD ISLAND: Atlas Cove and Cape Gazert (Dell, 1964).

Nacella terroris (Filhol, 1880)

(Pl. 73, fig. 12; Pls. 174, 182)

Range—Campbell Island, only, New Zealand subantarctic.

Remarks—This species marks the furthest north attained by this cold water genus in the New Zealand area, the latitude of Campbell Island being 52° 33' S. It is also interesting that at this same location, *Cellana strigilis* is abundant, in turn marking the most southerly occurrence of that warm water Indo-Pacific genus.

Description—Shell moderately large, up to 57 mm. (2¼ inches) in length, strong but of light build, rather broadly ovate, and high-conical, with the apex at about the anterior third. Sculpture consisting of about 50 narrow radial ribs, about 40 of them primary, the remaining ones being short and interpolated around the posterior margin. The whole surface is crossed by dense, crisp, undulating concentric growth lamellae,



Plate 181. *Nacella (Patnigera) flammea* (Gmelin, 1791). Strats of Magellan, 27 mm. & 33.5 mm., AWBP coll. 46064.

that thicken where they cross the radials. Colour of exterior reddish to greenish-brown, without markings; interior, pale purplish grey, densely radiately lined in reddish-purple, and with irregular blotches of bronzy reddish brown over the central area, which lacks a clearly defined spatula.

Animal—As in other members of the genus, there is a prominent scalloped epipodial fringe that lies between the edge of the foot and the branchial cord. This epipodial fringe is interrupted by the head but the branchial cord is not.

Radula—Formula 3 + 1 + (1+0+1) + 1 + 3. Moderately long and loosely coiled, in several volutions, on the right hand side of the animal, when viewed from above. This feature recalls the radula of *Cellana*, except that in that genus it is still longer and has more coils.

Measurements (mm.)—(all A. W. B. Powell, coll.).

length	width	height	
50.0	39.0	24.0	Perseverance Harbour
57.0	46.5	27.0	Perseverance Harbour
46.0	36.0	15.0	Perseverance Harbour
39.0	31.5	17.0	Perseverance Harbour
33.25	26.75	15.0	Perseverance Harbour

Synonymy—

1880 *Patella terroris* Filhol, Compt. Rend., vol. 91, p. 1095.

1885 *Patella terroris*: Filhol, Mission l'Île Campbell, p. 529.

1913 *Nacella (Patimigera) illuminata* (non Gould): Suter (in part), Man. N. Z. Moll., p. 77.

1955 *Patimigera terroris*: Powell, D.S.I.R. Cape Exped. Ser., Bull. 15, p. 69.

Types—The type specimens are in the Muséum National d'Histoire Naturelle, Paris.

Records—CAMPBELL ISLAND (type), New Zealand sub-antarctic: Perseverance Harbour, on rocks at low tide (Auck. Mus.; AWBP coll.).



Plate 182. Figs. 1, 2. *Nacella (Patimigera) macquariensis* Finlay, 1927. Hurd Point, Macquarie Island, 40 mm., AWBP coll. 42864. Figs. 3, 4. *Nacella (Patimigera) terroris* (Filhol, 1880). Perseverance Harbour, Campbell Island, 52 mm., AWBP coll. 26164.

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